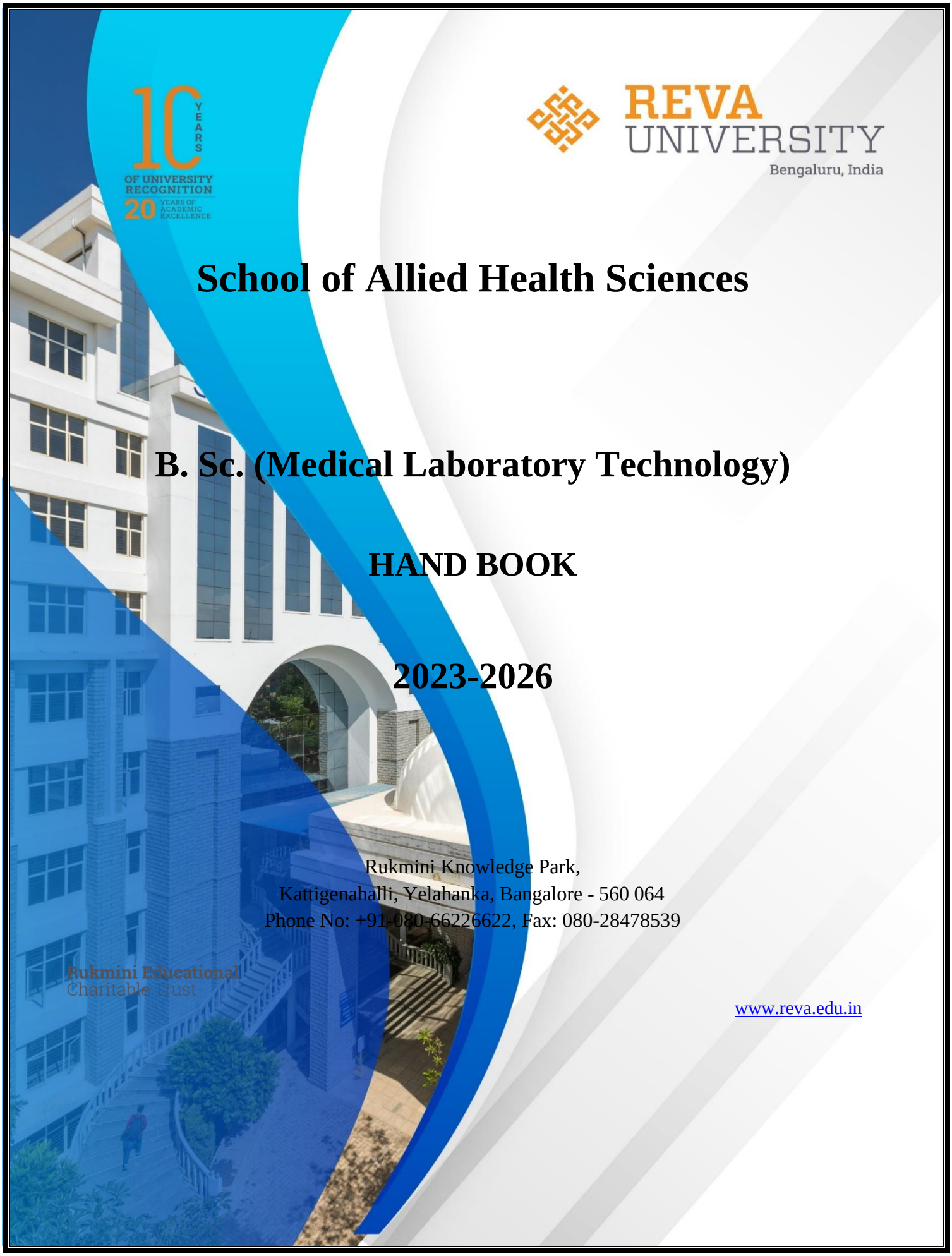

10 YEARS OF UNIVERSITY RECOGNITION
20 YEARS OF ACADEMIC EXCELLENCE

REVA UNIVERSITY
Bengaluru, India

School of Allied Health Sciences

B. Sc. (Medical Laboratory Technology)

HAND BOOK

2023-2026

Rukmini Knowledge Park,
Kattigenahalli, Yelahanka, Bangalore - 560 064
Phone No: +91-080-66226622, Fax: 080-28478539

Rukmini Educational Charitable Trust

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 educational and 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

Pro Chancellor's Message

The pursuit of academic excellence has been the cornerstone of REVA University. We are dedicated to establishing an educational institution that goes above and beyond conventional learning, revolutionising the field of education using cutting-edge techniques. We intend to create an environment that moulds students into holistic beings. By doing this, we continue to be the torchbearers of education by improving our position to be a Social Impact University and bringing about positive changes in our overall development.

For REVA, the year 2023 has been an eventful one. We are ranked among the top 100 Universities in NIRF Innovation ranking. We have also entered Times World University Higher Education Rankings in 2023 in the first attempt. We started several new courses that match industry standards and education trends. We began programmes like B.Sc. Sports Science, B. Tech Agriculture Engineering, and B. Tech Aerospace Engineering that are in alignment with the trends.

REVA offers a setting where extracurricular endeavours and academic proficiency go hand in hand, relentlessly pursuing a path of greatness in every field. We balance the two by offering top-notch facilities and meticulously planned learning environments. At REVA, we have integrated technology in the most transparent manner with cutting-edge labs, an expansive central library, a fully-equipped fitness centre, a cutting-edge sports facility, and designated areas for extracurricular activities.

At REVA, we always value the commitment and dedication of our faculty and staff. They empower, support and guide students to strengthen their skills, generate confidence and help them soar high in their chosen fields.

Best wishes,

Mr Umesh S Raju

Pro 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.

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. Dhanamjaya M
Vice-Chancellor, REVA University

Message from the Associate Dean

Dear students,

Welcome to the realm of Medical Laboratory Technology, where innovation meets the frontlines of healthcare! As the Associate Dean, I extend my enthusiastic regards to each of you joining this transformative journey.

You are not merely students; you are liberators in the making—armed with knowledge, dedication, and a commitment to revolutionize healthcare through the lens of laboratory sciences.

Medical Laboratory Technology isn't just about conducting tests; it's about deciphering the language of cells, understanding the whispers of molecules, and decoding the mysteries of diseases. It's about wielding technology to unveil the invisible, to detect, diagnose, and pave the way for healing and prevention.

In this program, you'll explore a myriad of subjects—from clinical chemistry to immunology, from microbiology to molecular diagnostics. These are your tools, your allies, in the noble pursuit of unravelling the secrets of health and disease. Our faculty, a league of mentors and visionaries, is here to ignite your passion, challenge your intellect, and guide you through this exhilarating expedition. They will empower you not just with knowledge but with the spirit of inquiry, urging you to push boundaries and question conventions. But remember, your journey doesn't stop within these walls. It extends into laboratories, hospitals, and communities. It’s about embracing challenges, adapting to new technologies, and advocating for accuracy, ethics, and excellence in your endeavours’ liberators, you are the architects of change in healthcare. Your perseverance, your commitment to precision, and your thirst for knowledge will define the future of diagnostics and treatment. Embrace this opportunity. Collaborate, innovate, and celebrate the marvels of discovery. Let your aspirations soar, for you are the torchbearers of progress in the world of Medical Laboratory Technology.

Our faculty comprises dedicated professionals and experts in their respective fields, ready to guide, mentor, and support you throughout your academic journey. You'll not only gain theoretical knowledge but also engage in hands-on experiences in our state-of-the-art laboratories. These practical encounters will shape your skills, hone your techniques, and prepare you for the challenges and advancements in the ever-evolving landscape of healthcare.

Furthermore, as future leaders in medical laboratory technology, you'll also delve into management, ethics, and the importance of quality assurance in laboratory practices. These aspects are as crucial as your technical expertise and will Mold you into well-rounded professionals poised to make a difference in the healthcare industry. Remember, your commitment, dedication, and passion will be the driving forces behind your success. Embrace every opportunity to learn, ask questions, and push boundaries.

Vision and Expectations: The Dean shares the program's vision and goals, emphasizing the expectations from students—encouraging them to engage actively, participate in discussions, embrace practical learning, and uphold

ethical standards. They may stress the importance of critical thinking, problem-solving, and professionalism in the field. Opportunities Beyond Academia: Additionally, the Dean might mention opportunities available outside the classroom, such as internships, research collaborations, and community engagement initiatives, encouraging students to explore and make the most of these opportunities to enrich their learning experience.

Encouragement and Motivation: The message usually ends with words of encouragement, motivating students to pursue their passion, overcome challenges, and aspire for excellence. It often inspires a sense of responsibility and commitment to the field and the broader community they'll serve in the future.

Collaboration is another key aspect of your journey. I urge you to foster a sense of camaraderie and teamwork among your peers. The ability to work effectively in interdisciplinary teams is vital in the Allied Health Sciences, and by embracing collaboration, you will learn from one another and develop the skills necessary for future professional success.Medical Laboratory Technology (MLT) plays a pivotal role in the healthcare system and is crucial for several reasons: Disease Diagnosis and Monitoring: MLT professionals perform tests on various bodily fluids and tissues to aid in the diagnosis, treatment, and monitoring of diseases. They provide valuable data that physicians and healthcare providers use to make informed decisions about patient care. Preventive Medicine: MLT isn't just about diagnosing diseases; it's also integral to preventive medicine. Screening tests conducted by MLT professionals help detect diseases in their early stages, allowing for timely intervention and prevention of complications. Quality Patient Care: Accurate and reliable laboratory results are fundamental in ensuring quality patient care. MLT professionals are responsible for conducting tests meticulously and precisely, as their findings significantly influence patient treatment plans. Innovations in Healthcare: MLT is at the forefront of technological advancements in healthcare. The field continually evolves with new testing methodologies, instrumentation, and diagnostic techniques, contributing to improved patient outcomes and advancements in medical science. Research and Development: MLT professionals often contribute to research endeavours, working on developing new tests, improving existing methodologies, and contributing to scientific literature. Their insights and findings drive advancements in the field of medicine. Public Health and Epidemiology: MLT also plays a role in tracking and monitoring public health trends. By analysing population-level data and conducting tests for infectious diseases, MLT professionals contribute to understanding and controlling epidemics and outbreaks. Interdisciplinary Collaboration: MLT professionals work closely with other healthcare professionals, including physicians, nurses, and specialists. Their collaboration ensures a holistic approach to patient care, where laboratory results complement clinical assessments for comprehensive diagnosis and treatment. Regulatory Compliance and Quality Assurance: Adhering to stringent regulatory standards and maintaining quality control are fundamental in laboratory settings. MLT professionals ensure that laboratories operate within regulatory frameworks and maintain the highest standards of accuracy, precision, and safety. In essence, Medical Laboratory Technology is the backbone of modern healthcare, providing indispensable information and support for patient care, disease management, and healthcare innovation.

Without the crucial work carried out by MLT professionals, the accuracy and effectiveness of diagnosis and treatment in healthcare would be compromised. Remember, your journey here is not just about acquiring a degree, it is about embracing a lifelong commitment to improving the health and performance of individuals through evidence-based practices. I wish you a rewarding and transformative experience in our Allied Health Sciences Sports Science course. Embrace the challenges, seize the opportunities, and always strive for excellence.

Sincerely,

Prof. Pasupuleti Visweswara Rao, FAPAS, FMSA, FIAAM
Associate Dean,
School of Applied & Allied Health Sciences, 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 has grown 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 enjoy the 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 Science

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. The B.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 enjoy the curriculum, teaching and learning environment, the vast infrastructure and the experienced teachers involvement and guidance. We will strive to provide all needed comfort and congenial environment for your studies. I wish all students a pleasant stay in REVA and grand success in your career.

Head, School of Allied Health Sciences.

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 of Education (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.

ABOUT REVA UNIVERSITY

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-conditioned library 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 unique feature 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 well experienced qualified faculty supported by the experts from industries, business sectors and such other organizations. REVA University has also initiated many supportive measures such as bridge courses, 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 other institutions 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 core areas 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 & Dean, 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. It is 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 and conduct 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 Dean 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. REVA also 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 everyday 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 Sciences offers graduate programs in Medical Laboratory Technology, Medical Radiology and Diagnostic Imaging, also 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 presently offers BSc Medical Radiology and Diagnostic Imaging, BSc Medical Laboratory Technology, BSc Nutrition and Dietetics and Diploma in Medial Laboratory Technology.

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 contemporaryknowledge in various branches of Biological and Allied health Sciences that are sociallyrelevant and transform them to become global paramedical citizens.

Mission

1. Committed to provide students with well-equipped advanced laboratory and research facilities.
2. To provide highest quality learning environment, teaching methods, programme specificcurriculum, and the changing patterns of skills that is demanded by modern health care.
3. To impart knowledge and skill-based training to create cadre of globally competent Biochemistry and Allied Health Care professionals.

4. To provide an opportunity to expose students to intellectual environment and a specialized body of knowledge
5. To develop their proficiency in laboratory techniques in collaboration with leading Heath sectors and Industries.
6. To improve the quality of life and society by teaching moral values and enhancing leadership qualities.

Values

Excellence in all our academic and research endeavours
Dedication and service to our stakeholders
Leadership through innovation
Accountability and transparency
Creating conducive academic environment with service motto
Integrity and intellectual honesty
Ethical and moral behaviour
Freedom of thought and expression
Adaptability to the change
Team-work.

"The constant questioning of our valuesand achievements is a challenge without which neither science nor society can remain healthy" ― Aage Niels Bohr

Advisory Board

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.Veera Raghavan** **Professor** **School of Allied Health Sciences** **REVA University** **veera.raghavan@reva.edu.in** **9880241577**	Internal Member
5	**Dr. Ramesh Kumar Kushwaha** **School of Allied Health Sciences** **REVA University** **rameshkumar.k@reva.edu.in** **7905947987**	Internal Member
6	**Prof. Deepa H N** **School of Biochemistry, REVA University** **deepa.hn@reva.edu.in** **9739355443**	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 necessitating more 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 meet the 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 organisations and also helps to go forward and pursue higher studies and make career in research and development to medical diagnostics or scientific organisation.

The Programme Educational Objectives are to prepare the students:

- State the importance of the medical laboratory and the part it plays in the diagnosis and treatment of the patient. Perform proficiently routine laboratory procedures and some specialized procedures.
- Add new procedures and duties to his/her repert with ease using the basic knowledge acquired in the clinical program and will demonstrate the ability to read and understand a procedure manual in order to perform testing.
- Judge the validity of laboratory results, confirm abnormal results, and integrate and relate data generated by various departments while making decisions regarding possible

discrepancies in routine tests.

- Utilize quality control methods and standards in maintaining accuracy and precision. Perform some basic preventative maintenance of equipment and instruments.
- Evaluate new methods and procedures with minimal assistance by applying knowledge of principles, procedures, and techniques.
- Recognize a problem and identify the cause; apply the problem-solving approach to situations including making decisions concerning the results of quality control and quality assurance measures.
- Communicate ideas and data and exhibit professional conduct through interpersonal skills with patients, laboratory personnel, other healthcare professionals, and the public. Recognize the need to be responsible for his/her work and to respond to constructive criticism in a positive manner.
- Exhibit compassion and respect for the patient and allied health care personnel. Recognize the importance of information concerning the patient and realize that it should not be discussed indiscriminately.
- Attend continuing educational programs to establish and maintain continuing education as a function of growth and maintenance of professional competence. Follow established safety procedures in the performance of his/her laboratory duties in order to maintain a safe working environment for himself/herself and other laboratory employees.
- Apply principles of current laboratory information systems. Write simple procedures for collecting, processing and analyzing biological specimens and other substances following established guidelines.

Programme Educational Objectives (PEOs)

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 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
PEO-4	Acquire higher degree of work in academics and research

Programme Outcomes (POs)

PO1. Knowledge& Skills : Apply the knowledge of Laboratory knowledge for the solutions to the problems in various diagnostic domains particularly for Health Care industries/Hospitals.

PO2. Problem analysis: Identify and analyze problems related to various lab domains of clinically laboratory procedures

PO3. Conduct investigations of relevant problems: Comprehend, analyze and solve complex problems in the areas of Medical Laboratory technology

PO4: Modern technique Usage: Use latest technique and tools to carry out scientific investigations and develop new Lab techniques to solve problems

PO5: Practice and Risk Management: Professional conduct in the hospital to minimize cross infection by following rules/regulations and standard control mechanism and incorporating latest advances in the medical field.

PO6: Individual and team work: Recognize the need to expertise in the areas of medical lab technology by self-up gradation through lifelong learning.

PO7: Communication: Communicate with clarity and coherence, both written and verbally to the patients and all healthcare workers.

PO8: Ethics : Practice professional and ethical responsibilities with high degree of credibility, integrity and social concern.

PO9: Project management & Evidence based practice: Encourage collaborative learning without any discriminations and analyze the impact of lab practices in global, economic, environmental and societal context.

P1O. Life long learning: Promote regular training and follow Quality protocols for the development of professionalism throughout the life.

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, 2021-2024

(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- 2020".**

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. Eligibility for Admission:

Pass in PUC/10+2 examination with life science/Biology as compulsory subjects with minimum 45% marks (40% in case of candidate belonging to SC/ST category) in the above subjects taken together of any Board recognized by the respective State Government /Central Government/Union Territories or 2 years DMLT(10+2) or any other qualification recognized as equivalent thereto.

6. Scheme, Duration and Medium of Instructions:

6.1 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.

7. 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 ThreeYear 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.

8. Add-on Proficiency Certification / Diploma:

8.1 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.

8.2 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.

9. 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 to choose 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.

10. 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 submit final report of the project / dissertation, as the case may be, for final evaluation. The components of 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

11. 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.

12. Eligibility to Appear Semester End Examination (SEE)

12.1. Only those students who fulfil a minimum of 75% attendance in aggregate of all the courses including practical courses / field visits etc, as part of the course(s), as provided in the succeeding sections, shall be eligible to appear for SEE examination.

12.2. Requirements to Pass a Course

Students are required to score a total minimum of 40% (Continuous Internal assessment and SEE) in each course offered by the University/ Department for a pass (other than online courses) with a minimum of 25% (12) marks in final examination.

13. 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.

13.1 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 thefirst 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.

14. Attendance Requirement:

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

14.2 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).

15. 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.

16. 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)	Letter Grade	Performance	FGP
	G			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

17. 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 by submitting 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	√	√	√	√	√	√	√	√
PE04	√	√	√	√	√	√	√	√

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
B23HA0101	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
B23HA0102	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
B23HA0103	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
B23HA01 04	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
B23HA01 05	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
B23HA01 06	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
B23HA02 01	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
B23HA02 02	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
B23HA02 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
B23HA02 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
B23HA02 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
B23HA02 06	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
B23HA03 01	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

B23HA0302	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
B23HA0303	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
B23HA 0305	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
B23HA0306	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
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
B23HA0307	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
B23HA0308	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
B23HA04 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
B23HA04 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
B23HA04 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
B23HA04 04	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 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
B23HA04 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

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
B23HA04 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
B23HA04 08	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
B23HA05 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
B23HA05 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	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B23HA05 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
B23HA05 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
B23HA05 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
B23HA05 07	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
B23HA06 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
B23HA06 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
B23HA06 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	3	3	1	2	1	2	3	3	1	2	2

B23HA0604	POS/COs	PO1	P02	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
CO1	3	3	1	2	1	2	3	3		1	1	
CO2	3	3	1	2	1	2	3	3		2	2	
CO3	3	3	1	2	1	2	3	3		1	2	
CO4	3	3	1	2	1	2	3	3		2	2	
B23HA0605	POS/COs	PO1	P02	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
CO1	3	3	1	2	1	2	3	3		2	2	
CO2	3	3	1	2	1	2	3	3		1	1	
CO3	3	3	1	2	1	2	3	3		1	1	
CO4	3	3	1	2	1	2	3	3		1	2	
B23HA0606	POS/COs	PO1	P02	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	3	2	1		1	2	
CO2	3	3	3	2	2	2	2	3		2	1	
CO3	3	3	2	3	3	2	1	2		1	1	
CO4	2	2	3	3	3	2	1	3		1	2	

Mapping of PEOS with Respect to PO's

	PO1	PO 2	PO3	PO4	PO5	PO6	P0 7	PO8	PSO1	PSO2	PSO3
PEO1	√	√	√	√	√	√	√	√	√	√	√
PEO2	√	√	√	√	√	√	√	√	√	√	√
PEO3	√	√	√	√	√	√	√	√	√	√	√
PEO4	√	√	√	√	√	√	√	√	√	√	√

B.sc (Medical Laboratory Technology) Program

(Effective from the Academic Year 2023-26) 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 and Value				Weekly Contact Hours	Teaching School/Dept.
				L	T	P	C		
First Semester:									
1	B23AHE101	Language- I: Communicative English	AEC	3	0	0	3	3	Arts and Humanities
2	B23HA0101	Human Anatomy-I	CC	2	1	0	3	3	Allied health Sciences
3	B23HA0102	Human Physiology-I	CC	2	1	0	3	3	Allied health sciences
4	B23HA0103	Biochemistry-I	HC	2	1	0	3	4	Allied health sciences
5	B23HA0104	Microbiology-I	HC	2	1	0	3	4	Allied health sciences
6	B23HA0105	Pathology-I	HC	2	1	0	3	4	Allied health sciences
		Practicals							
7	B23HA0106	Practical: Human Anatomy	HC	0	0	2	2	3	Allied health sciences
Total Credits for the First Semester:							**19**	**24**	

Second semester

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

1	B23HA0201	Human Anatomy-II	CC	2	1	0	3	4	Allied health Sciences
2	B23HA0202	Human Physiology-II	CC	2	1	0	3	4	Allied health sciences
3	B23HA0203	Biochemistry-II	HC	2	1	0	3	4	Allied health sciences
4	B23HA0204	Microbiology-. II	HC	2	1	0	3	4	Allied health sciences
5	B23HA0205	Pathology-II	HC	2	1	0	3	4	Allied health sciences
		Practicals							
6	B23HA0206	Practical: Human Physiology	HC	0	0	2	2	3	Allied health sciences
7	B22AS0207	Tree Plantation Vanamhotsava		0	0	0	1	1	
Total Credits for the Second Semester:							**18**	**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	B23HA0301	Biochemistry- III	HC	2	1	0	3	4	Allied health sciences
2	B23HA0302	Microbiology-III	HC	2	1	0	3	4	Allied health sciences
3	B23HA0303	Pathology-III	HC	2	1	0	3	4	Allied health sciences
4	B23HA0304	Open Elective	HC	2	1	0	3	4	Allied health sciences
5	B23HA0305	Skill Development Health Care	SC	2	0	0	2	2	Allied health sciences

		Practicals							
6	B23HA0306	Practical: Biochemistry-I	HC	0	0	2	2	4	Allied health sciences
7	B23HA0307	Practical Pathology -I	HC	0	0	2	2	4	Allied health sciences
8	B23HA0308	Practical Microbiology-I	HC	0	0	2	2	4	Allied health sciences
9	B23HA0309	Clinical Postings-1	HC	0	0	2	2	4	Allied health sciences
Total Credits for the Third Semester:							**22**	**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	B23HA0401	Pathology-IV	HC	2	1	0	3	4	Allied health sciences
2	B23HA0402	Microbiology -IV	HC	2	1	0	3	4	Allied health sciences
3	B23HA0403	Biochemistry-IV	HC	2	1	0	3	4	Allied health sciences
4	B23HA0404	Pharmacology	SC	2	0	0	2	4	Allied health sciences
5	B23HA0405	Clinical Database Management 1	HC	2	1	0	3	3	Allied health sciences
		Practicals							
6	B23HA0406	Practical: Biochemistry-II	HC	0	0	2	2	4	Allied health

									sciences
7	B23HA0407	Practical Microbiology-II	HC	0	0	2	2	4	Allied health sciences
8	B23HA0408	Practical Pathology-II	HC	0	0	2	2	4	Allied health sciences
9	B23HA0409	Clinical Postings-II	HC	0	0	2	2	6	Allied health sciences
Total Credits for the Fourth Semester:							**22**	**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	B23HA0501	Microbiology-V	HC	2	1	0	3	4	Allied health sciences
2	B23HA0502	Biochemistry-V	HC	2	1	0	3	4	Allied health sciences
3	B23HA0503	Pathology-V	HC	2	1	0	3	4	Allied health sciences
4	B23HA0504	Clinical Database Management II	HC	2	1	0	3	3	Allied health sciences
		Practicals							
5	B23HA0505	Practical: Biochemistry-III	HC	0	0	2	2	4	Allied health sciences
6	B23HA0506	Practical: Microbiology-III	HC	0	0	2	2	4	Allied health sciences
7	B23HA0507	Practical: Pathology-III	HC	0v	0	2	2	4	Allied health sciences

8	B23HA0508	Clinical Postings-III	HC	0	0	2	2	6	Allied health sciences
Total Credits for the Fifth Semester:							**20**	**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	B23HA0601	Pathology -VI	HC	2	1	0	3	4	Allied health sciences
2	B23HA0602	Microbiology-VI	HC	2	1	0	3	4	Allied health sciences
3	B23HA0603	Biostatistics and Molecular Biology	HC	2	1	0	3	4	Allied health sciences
4	B23HA0604	Communicative Medicine	SC	2	0	0	2	3	
		Practicals							
5	B23HA0605	Practicals: Pathology -IV	HC	0	0	2	2	4	Allied health sciences
6	B23HA0606	Practicals: Microbiology-IV	HC	0	0	2	2	4	Allied health sciences
7	B23HA0607	Practicals: Parasitology	HC	0	0	2	2	4	Allied health sciences
8	B23HA0608	Internship	HC	0	0	7	7	7	Allied health sciences
Total Credits for the Sixth Semester:							**24**	**32**	
Total Credits of all Semesters							**125**		

Semester-wise Summary of Credit Distribution

Semester	L	T	P	Total	Total Hours

I	12	06	02	19	24
II	13	03	04	18	28
III	11	03	06	22	30
IV	08	05	08	22	37
V	07	04	09	20	33
VI	06	03	10	24	32
Total Credits	**57**	**24**	**39**	**125**	**187**

DETAILED SYLLABUS

SEMESTER I

B23AHE101	**LANGUAGE- I: COMMUNICATIVE ENGLISH**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

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

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	PO7	PO8	PSO1	PSO2	PSO3
B23AHE102	CO1					3	3	3	3			
	CO2					3	3	3	2			
	CO3					3	3	3	2			
	CO4					3	3	3	3			

UNIT –I

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

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

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

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

B23HA0101	HUMAN ANATOMY-I	L	T	P	C
		2	1	0	3

Course objectives

1. To understand the organization of human body and general histology
2. To obtain knowledge regarding the organization of cardiovascular system and lymphatic system
3. To understand the structure of skeletal system
4. To understsnd the importance of nervous system

Course Outcomes

CO1. To learn about cell structural organization tissues and types of gland of the Human Body

CO2. Able to understand the cardiovascular system

CO3. Acquire knowledge about the structure and functions of Skeletal system

CO4. Able to understsnd the nervous system structure and its important role

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	PO 7	PO8	PSO1	PSO2	PSO3
B23HA0101	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

UNIT-I 12 Hrs

HISTOLOGY

General Histology, study of the basic tissues of the body; Microscope, Cell, Epithelium, Connective Tissue, Cartilage, Bone, Muscular tissue, Nerve Tissue – TS & LS

Circulatory system – large sized artery, medium sized artery, large sized vein

Lymphoid tissue

EMBRYOLOGY

Ovum, Spermatozoa, fertilization and formation of the Germ layers and their derivations.

Development of skin, Fascia, blood vessels, lymphatic,

Development of bones, axial and appendicular skeleton and muscles,

Neural tube, brain vessels and spinal cord,

Development of brain and brain stem structures.

UNIT–II

THORAX AND ABDOMEN

Osteology of vertebral column

Identify and classify vertebrae – typical & atypical

Parts and features of typical vertebrae

Features of thoracic, lumbar, sacral, coccyx.

Intervertebral joint – articulating surface, movements, stability, mobility

Curvatures of vertebral column.

Contents of vertebral canal.

Sternum – parts, features (borders, surfaces, muscle attachments)

Define true, false, floating ribs

Mention parts and features of atypical rib.

Type and formation of joint between rib and vertebrae, between costal cartilage, costal cartilage and sternum, between parts of sternum. Sternal angle. Intercostals space and its contents. Intercostals nerve – course and its branches Intercostals muscle – origin, insertion, nerve supply, action. Diaphragm – origin, insertion, nerve supply, action, orifice, structures passing through Diaphragm.

Movements of ribs – pump handle and bucket handle movement.

PELVIS

Formation and subdivision of bony pelvis

List features of male and female bony pelvis

Type, articular surface, ligaments, movements of joints of pelvis

Abdominal cavity and layers of abdominal wall (ant & post), (O, I, NS, ACT)

Rectus sheath

Inguinal canal (position, extent, formation, content)

Branches and distribution of abdominal aorta and iliac arteries

Mention features of pubic symphysis and sacroiliac joint

Muscles of pelvic floor (attachment, action, nerve supply)

Structures of urogenital diaphragm

UNIT–III 12 Hrs

1. OSTEOLOGY

Identify parts, borders, surfaces, attachments of bones– clavicle, scapula, humerus, radius, ulna, carpal bones, Meta carpal, phalanges.

2. ARTHROLOGY

Type, articular surface, muscle, ligaments, movements blood supply, nerve supply of joints- Sternoclavicular, acromioclavicular, shoulder, elbow, radio ulnar, IP, MCP, CMC

3. MYOLOGY

Identify muscles – origin, insertion, nerve supply, action of muscles of scapula, upper arm, lower arm

4. NEUROLOGY

Identify nerves of upper limb and its origin, course, division, innervations, Relation, its applied anatomy of radial nerve, median nerve, ulnar nerve, Axillary nerve, musculocutaneous nerve.

Brachial plexus – formation and root values. Dermatome of UL.

5. ANGIOLOGY Distribution of blood vessels, lymph nodes, main arteries and veins of UL - Axillary, brachial, radial, ulnar arteries.

6. AXILLA

Identify boundaries, contents of axilla, branches of axillary artery and its relation.

1. Scapulothoracic rhythm
2. Cubital fossa – Boundaries, contents, relation

UNIT-IV 12 Hrs

1. OSTEOLOGY

Identify parts, border, surface, attachments of bones – hip bone, femur, tibia, Fibula, patella, tarsal bones, Meta tarsal bones, phalanges

2. ARTHROLOGY

Type, articular surface, muscle, ligaments, movements, blood supply, nerve supply, of Joints – hip, knee, tibiofibular, tarsal

3. MYOLOGY

Identify origin, insertion, nerve supply, action of muscles of – thigh, leg, sole of foot

4. NEUROLOGY

Identify plexuses, nerves of LL, origin, course, innervations, applied anatomy, Relation of femoral nerve, sciatic nerve, tibial nerve, common peroneal nerve, Obturator nerve, superficial and deep peroneal nerve.

Lumbar plexuses, Sacral plexuses.

5. ANGIOLOGY

Distribution of blood vessels, lymph node of LL, main arteries and veins of LL – Femoral artery, femoral vein, tibial artery, posterior tibial artery, Femoral triangle, Popliteal fossa – boundaries and contents.

Arches of foot.

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. Ross & Wilson Anatomy & Physiology in Health & Illness by Waugh (A)
5. Ross & Wilson,(2014),Anatomy & Physiology in health & illness,11th edition, Elsevier Publications

B23HA0102	HUMAN PHYSIOLOGY-I	L	T	P	C
		2	1	0	3

Course Objectives :

1. To understand about the general physiology
2. To understand about Cardiac physiology
3. To understand about nerve Muscle Physiology
4. To understand about the endocrine system and its physiology

Course Outcomes :

CO1. Achieve knowledge about general physiology of the cell its role Various blood cell, and blood component

CO2. Acquire knowledge on cardiovascular system, cardiac cycle, blood pressure & heart rate

CO3. Able to understand nerve cell & nervous system, nerve impulse, and EEG

CO4. Acquire active knowledge on the endocrine Physiology

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0102	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

General Physiology: Cell: morphology, Structure and function of cell organelles structure of cell membrane, transport across cell membrane Intercellular communication Homeostasis, Body Fluids- Distribution and composition

Nerve Muscle Physiology: Muscles- classification, structure, properties, Excitation contraction

coupling Motor unit, EMG, factors affecting muscle tension, Muscle tone, fatigue, exercise Nerve – structure and function of neurons, classification, properties Resting membrane potential & Action potential their ionic basis.

All or None phenomenon Neuromuscular transmission Ionic basis of nerve conduction Concept of nerve injury & Wallerian degeneration Synapses Electrical events in postsynaptic neurons Inhibition & facilitation at synapses Chemical transmission of synaptic activity Principal neurotransmitters.

UNIT- II Cardio Physiology **12Hrs**

Blood: Introduction-composition & function of blood W.B.C., R.B.C, platelets formation & functions, Immunity, Plasma: composition, formation & functions, Plasma Proteins: -types & functions Blood Groups-types, significance, determination Hemoglobin Haemostasias Lymph- composition, formation, circulation &functions.

Structure of muscle – Macroscopic & Microscopic (Myofibril, Myoneural junction)

Properties of skeletal muscle

Cardiac and smooth muscle

Chemical process involved in muscle contraction

Motor unit, EMG

Effect of exercise on muscular system

Exercise metabolism– O2 dept, respiratory quotient

UNIT- III **12Hrs**

REPRODUCTION

Male reproductive system

Female reproductive system

Pregnancy, function of placenta, parturition, lactation, contraception

Puberty and Menopause Spermatogenesis and Oogenesis Menstrual cycle

ENDOCRINE

General organization of endocrine glands

General metabolism – Carbohydrate, Fat, Protein

UNIT- IV

12Hrs

Special Senses: Vision: Cross-section of eye, Functions of aqueous humor, Visual pathway, visual filed defects, Accommodation to near vision, light reflex, refractory errors of the eye, Visual acuity

Hearing: Structure and functions of external, middle and inner ear, Mechanism of hearing, Vestibular apparatus: Parts and function, Receptors for taste and smell sensations

Cardiovascular system: Cardiac Muscles, conducting system-components, impulse conduction

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

B23HA0103	BIOCHEMISTRY -I	L	T	P	C
		2	1	0	3

Course Objectives

1. To understand the role of a medical laboratory technician and organization of lab
2. To understand about the basic instruments used in the laboratory apparatus handling and maintenance
3. To Understand about the preparation of reagents and buffers with units and measurements
4. To know about the various analysers used in Biochemistry Laboratory

Course Outcomes

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

CO2. Acquire knowledge to use of basic instrumentation

CO3. Able to learn and prepare reagents and buffer

CO4. Apply knowledge on learning understanding about the various analysers its Principle and applications

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0103	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 12 hrs

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. safety measures, personal hygiene and universal safety precautions.

Unit II 12 hrs

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 12 hrs

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 12 hrs

Types of analyzers - Semi-auto analyzer - Batch analyzer - Random Access auto analyzers. Steps in the automated systems - Responsibilities of a technician in the maintenance of the analyzers. Specimen collection and processing of blood, 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. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
3. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers
4. Pearson's Biochemistry.Christopher K. Mathews, Kensal E. van Holde,Dean R.Appling,Spencer J. Anthony-Cahill
5. Biochemistry. Donald Voet, Judith G. Voet

B23HA0104	MICROBIOLOGY-I	L	T	P	C
		2	1	0	3

Course objectives

1. To learn the fundamental aspects of microbiology including taxonomy and classification
2. To understand about Sterilization technique employed in microbiology Laboratory
3. To learn about staining for the identification of Various bacteria
4. To learn about Microscopy and its applications

Course outcomes

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

CO2. Acquire the knowledge of Various Sterilization techniques employed in microbiology Laboratory

CO3. Learn about different Staining techniques used in microbiology.

CO4. Gain knowledge about various microscopes

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0104	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 Contribution of Scientists to the field of Microbiology- Anton Von Leewenhoek, Edward, Jenner, Lazaro Spallanzani, Louis Pasteur, Joseph Lister, Robert Koch, Paul Ehrlich, Alexander Flemming classification and taxonomy of bacteria : General account of Bacteria, Fungi, Protozoa, Algae and Viruses Structure of bacteria bacterial growth and nutrition introduction to aerobes anerobes facultative anerobes

UNIT-II 12Hrs

Sterilization definition physical and chemical methods of sterilization media (basal enriched enrichment selective differential transport) inoculation methods, incubation methods, morphological study of bacterial colonies on solid media and liquid media, anaerobic culture methods. Biochemical media Tests for the metabolism of Carbohydrates TSI, citrate utilization, MR, VP tests Tests for the metabolism of proteins and Amino acids- Indole, PPA, Tests for enzymes. - Catalase, Urease, Coagulase, and Oxidase. MMM and automated method of identification

UNIT-III 12Hrs

STAINING: Definition of stain. Acidophilic, Basophilic and Neutral stains. Preparation of smears, its fixation Principles,. Classification of stain Simple staining -Differential staining(Gram's staining, A.F.B.staining) classification of bacteria bases on gram staining capsule stain endospore stain definition of antibiotics and classification antibiotic sensitivity manual and automated methods

UNIT-IV 12Hrs

Defnition of microscopes, Classification of microscopes parts working advantages and disadvantages Simple and compound microscope Bright field microscopes Phase-contrast microscope Dark field microscope. -Fluorescent microscope. Electron microscope(SEM TEM)Principle, and parts Introduction to biosafety cabinets its types and laminar airflow chamber

Refrences

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

B23HA0105	PATHOLOGY-I	L	T	P	C
		3	1	0	4

Course Objective

1. To understand about cell Biology
2. To understand about cell Physiology
3. To understand about Cancer Biology
4. To understand about the various disorders of cell imbalance

Course Outcomes

CO1: To acquire knowledge about cell various organelles cell division and cell death

CO2: To acquire knowledge about cell injury and its mechanism

CO3:To gain knowledge about the characterstics of cancer cell and its types

CO4: To Acquire knowledge about various diseases related to cardiac system

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0105	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 Contents

UNIT-I 12Hrs

Introduction to Pathology: Introduction & History of pathology, Basic definitions in pathology, laboratory organization, care & maintenance of equipments specimens, Basic concepts of fixation and various types of fixative used in histopathology and cytopathology Introduction to Cell and cell organelles in detail (Mitochondria Plasma membrane cytoskeleton Endoplasmic reticulum Golgi apparatus Ribosomes Nucleus Lysosomes Peroxixomes vacuole)Functions of cell General Principles of cell communication cell signalling Cell division Mitosis Meiosis Necrosis apoptosis mechanism pathways of cell death

UNIT-II 12Hrs

Causes and mechanisms of cell injury, reversible and irreversible injury. Introduction of Hyperplasia, Hypertrophy, Atrophy, Metaplasia, Dysplasia, Hypoplasia Neoplasia necrosis and apoptosis. General features of acute and chronic inflammation: Vascular changes, cellular events, Cells and mediators of inflammation, tissue regeneration tissue repair wound healing factors affecting wound healing Phagocytosis mechanism.

UNIT-III 12Hrs

Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis, Carcinogens and cancer, concept of oncogenes, tumour suppressor genes, DNA repair genes and cancers stem cells

UNIT-IV 12Hrs

Defnition types pathogenesis lab diagnosis and treatment Fibrosis, cirrhosis, oedema, hyperaemia, congestion haemorrhage, thrombosis, embolism, infarction, shock and hypertension.

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)

B23HA0106	HUMAN ANATOMY (Practical)	L	T	P	C
		0	0	2	2

Course objectives

1. To understand about abdominal muscle joints
2. To understand about the histology
3. To know about the joints
4. To learn about the arteries

Course Outcomes

CO1. Acquire active knowledge of heart, vessel, artery and vein and microscopically differentiate

CO2. Acquire active knowledge and explain about lymph node, spleen, tonsil & thymus

CO3. Acquire active knowledge about parts about histology of kidney, ureter, urinary bladder

CO4. Acquire active knowledge on palpation

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3

B23HA0106	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 Contents

1.Thorax including surface anatomy, abdominal muscles joints

2. Histology-Elementary tissue including surface Anatomy

3. Embryology-models, charts & X-rays

4. Demonstration of the muscles of the whole body in a cadaver.

5. Demonstration of movements in important joints.

6. Identification of body prominences on inspection and by palpation especially of extremities.

8. Points of palpation of arteries.

SEMESTER-II

B23HA0201	HUMAN ANATOMY- II	L	T	P	C
		2	1	0	3

Course Objectives

1. To understand about cardiovascular system and GI system
2. To understand about Respiratory Male reproductive System
3. To understand about Female reproductive system
4. To understand about Nervous system

Course outcomes

CO1. Gain knowledge and understand the anatomy of CV and GI system

CO2. Gain knowledge and understand the anatomy of Respiratory system and Male reproductive system

CO3. Gain knowledge and understand the concepts of Special Senses

CO4. Gain knowledge and understand the Nervous system and Urinary system

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0201	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

CARDIOVASCULAR SYSTEM

Normal position, external features of heart and parts of heart, internal features of chambers of heart, blood supply, venous supply, conductive system.

GASTROINTESTINAL SYSTEM

The entire system of the GI including all the organs involved, about its anatomical position, parts, muscles and blood vessels involved, relations of each organ and its nervous supply.

This includes – Oral cavity, Pharynx, Stomach, Small Intestine, Large Intestine, Rectum & Anal canal. Digestive glands - Liver, Pancreas, Gall Bladder, Salivary glands

Large blood vessels of the gut. Location, size, shape, features, blood supply, nerve supply and functions of the following: stomach, liver, spleen, pancreas, intestines, gall bladder.

UNIT–II 12Hrs

RESPIRATORY SYSTEM

The entire system of the respiratory including all the organs about its anatomical position, Parts, Muscles and blood vessels involved, Relations of each organ and its nervous supply. The study about the organ, Nasal Cavity, Larynx, Trachea, Thoracic cage, Diaphragm, Pleura and Lungs.

Normal position, parts, relation, blood supply of URT & LRT, pleura and its reflection, nerve supply, bronchopulmonary segment, mechanics of respiration.

MALE REPRODUCTIVE SYSTEM

All the organs involved in male reproduction about its anatomical position, parts, muscles and blood vessels involved, Relations of each organ and its nervous supply. The organs are- testes, spermatic cord, Vas Deferens, prostate & penis.

UNIT-III 12Hrs

FEMALE REPRODUCTIVE SYSTEM

All the organs involved in female reproduction about its anatomical position, Parts, Muscles and blood vessels involved, relations of each organ and its nervous supply. The organs are-

Uterus, Fallopian Tube and Ovaries.

SPECIAL SENSES

The organs involved in special senses including Vision, Hearing & Balance, Olfaction, Taste and Skin & it appendages – Its parts, functions, blood and nerve supply.

ENDOCRINE SYSTEM

About all the glands including Pituitary, Thyroid, Parathyroid, Suprarenal – Its parts, positions, blood supply and lymphatic drainage.

UNIT-IV 12Hrs

NERVOUS SYSTEM

The study of Spinal Cord, Brain- All the parts, Functions and blood supply, Ventricles and Production of CSF along with its Circulation.

URINARY SYSTEM

All the organs involved in excretion about its anatomical position, parts, Muscles and blood vessels Involved, Relations of each organ and its nervous supply. The organs are Kidneys, Ureter, Urinary Bladder, Urethra- Both male and female. Position, parts, relation, blood supply, nerve supply, lymph drainage of kidney, ureter, urinary bladder, urethra. Innervations of urinary bladder.

References:

1. Human Anatomy by Inderbir Singh
2. Ross & Wilson Anatomy & Physiology in Health & Illness by Waugh (A)
3. Theory and Practice of Histological Techniques by Bancroft (JD)
4. Ross & Wilson,(2014),Anatomy & Physiology in health & illness,11th edition, Elsevier Publications
5. Chaurasia B D, (2016), Human Anatomy, 7th edition, CBS publishers
6. Gerard J. Tortora and Bryan H.Derrickson, (Principles of Anatomy and Physiology)

B23HA0202	HUMAN PHYSIOLOGY- II	L	T	P	C
		2	1	0	3

Course objective

1. To know about endocrine physiology
2. To know about the nerve physiology
3. To learn about the cardio physiology
4. To learn about respiratory physiology

Course outcomes

CO1. Able to understand the renal physiology and endocrinology

CO2. Able to understand the working of nerve physiology and special sense

CO3. Will acquire active knowledge on cardio physiology

CO4. Achieve knowledge about respiratory system and function of lungs

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA020	CO1	3	2	2	2	1	1	2	3	2	1	2

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

EXCRETION

Structure and function of kidney Structure and function of nephron Formation of urine – Filtration, Reabsorption, Secretion Micturition

ENDOCRINE

General metabolism – Carbohydrate, Fat, Protein

Physiological action, regulation, disorder of hormones – Adrenal, Pancreatic, Parathyroid, Thyroid

UNIT-II 12Hrs

SPECIAL SENSE

Vision – rods and cones, retina and its function, visual pathway

Hearing – organ of corti, auditory pathway

Olfaction

Taste – taste buds

NERVOUS SYSTEM

Outline the structure and function of central nervous system, Outline the ANS, Types of nerve cells, electrical. Properties of nerve cells, properties of mixed nerves, Reflex action, degeneration and regeneration of nerve, control of posture, outline of Voluntary movement, cutaneous, deep and superficial sensation, synaptic transmission, neuromuscular junction, properties of muscles, contractile response, types of contraction.

General organization of nervous system, Structure, type and function of neuron, Properties of neurons, Synapse and synaptic transmission, Neurotransmitters, Reflex – Properties and types, Sensory – Receptors, sensory pathway, pain pathway, referred pain, modulation of pain, Motor – Basal ganglia, Cerebellum, Cortex –Function & Effect of lesion, Ascending and Descending pathway, Posture and Equilibrium, Muscle tone

ANS – organization, function of SNS & PSNS

CSF – composition, formation, circulation, function

LMN & UMN lesion

UNIT- III 12Hrs

CARDIOVASCULAR SYSTEM

Cardiac Muscles, conducting system-components, impulse conduction, heart valves.

Cardiac cycle- definition, phases of cardiac cycle Cardiac output- definition, normal value, determinants. Stroke volume and its regulation Heart rate and its regulation: Arterial pulse, Blood pressure-definition, normal values, factors affecting blood pressure Shock-definition, classification, causes and features Basic idea of ECG Cardiovascular changes during exercise.

Structures and properties of heart muscle, action of heart, Normal ECG, Maintenance of Blood pressure, cardiac arrest and heart failure, hypertension, edema, central and peripheral venous pressure.

UNIT-IV 12Hrs

Respiratory System: Mechanics of respiration Lung volumes and capacities Pulmonary circulation, transport of respiratory gases Factors affecting respiration, Oxygen transport Regulation of respiration- neural regulation, voluntary control and chemical regulation Hypoxia, Hypercapnoea, Hypocapnoea, Artificial respiration Disorders of respiration- dyspnoea, orthopnoea, hyperpnoea, hyperventilation, apnoea, tachypnoea Respiratory changes during exercise.

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

B23HA0203	BIOCHEMISTRY-II	L	T	P	C
		2	1	0	3

Course objectives

1. To understand the basics of macromolecules such as carbohydrates
2. To understand the basics of Lipids and its types
3. To understand the basics of proteins
4. To understand the basics of nucleic acids

Course Outcomes

CO1. Achieve knowledge on basics of macromolecules such as carbohydrates

CO2. Achieve knowledge on basics of macromolecules such as lipids

CO3. Able to understand the fundamentals of aminoacids proteins in biochemical processes.

CO4. Able to understand the fundamentals of nucleic acids

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0203	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: Introduction to carbohydrate, classification, properties of monosaccharide, osazone formation, mutarotation. Introduction to disaccharide (lactose, maltose, sucrose) and polysaccharide (Heparin, starch, and glycogen) biological function of carbohydrate

UNIT-II 12Hrs

Introduction to lipid, occurrence, properties, classification of lipid. Importance of phospholipids, sphingolipid and glycerolipid. Biological function of lipid. Fatty acid, - Introduction, Nomenclature and classification of fatty acid Essential and non essential fatty acids.

UNIT-III 12Hrs

Introduction to amino acid, structure, classification of protein based on polarity. Properties (physical, chemical) Titration of amino acid. Essential and non essential amino acid. Amino and sequencing (EDMan and Sangar method).Protein Introduction to protein, classification of protein based on solubility, shape, composition and Function. Peptide bond – Structure of peptide bond. Denauration renaturation of protein, properties of protein. Introduction to lipoprotein, glycoprotein and nucleoprotein. Biological function of protein (Protein structure) Protein structure - Primary, secondary / tertiary and quaternary.

UNIT-IV 12Hrs

Introduction to nucleic acid, Difference between nucleotide and nucleoside, composition of DNA & RNA Structure of Nitrogen bases in DNA and RNA along with the nomenclature.

· DNA double helix (Watson and crick) model Introduction to A, B, Z DNA. Gene, genome and chromosome. Types of RNA , structure of t – RNA (clover leafmodel)

Reference Books:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
3. U Satyanarayan, (2008), Essentials of Biochemistry, 2nd edition, Standard Publishers
4. Medical laboratory Procedure Manual (T-M) by K.L. Mukerjee 1987, Vol.I, II & III Tata

McGraw Hill Publication.

B23HA0204	MICROBIOLOGY -II	L	T	P	C
		2	1	0	3

Course Objective

1. To understand the fundamental aspects of Immunology
2. To have an briefed idea on the Immune System
3. To understand about the antigen and antibody interactions
4. To understand the basics of hypersensitivity

Course Outcomes

CO1. Gain knowledge on fundamental aspects of Immunology
CO2. Acquire the knowledge on Immune System and its various parts involved in immunity
CO3. Gain knowledge on different types of antigens and antibodies
CO4. Gain knowledge on hypersensitivity

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0204	**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

Introduction- Immunity-Innate-anatomical barriers, chemical defenses. Adaptive Immunity- Active and Passive. Physiology of immune system-Primary and Secondary lymphoid organs Immune reactive cells-structure and functions-Macrophages, Phagocytosis, Dendritic cells, Granulocytes, NK cells, T and B lymphocytes.

UNIT-II 12Hrs

Antigens and immunogenicity-terminologies and definition-antigen, Immunogen, Haptens, Adjuvant, Epitope, Paratope, Autoimmunity. Factors influencing immunogenicity. Immunoglobulin- structure, types and properties. Monoclonal and polyclonal antibodies.

UNIT-III 12Hrs

Antigen-antibody interactions-Affinity- avidity, cross reactivity, Precipitation reaction SRID, Ouchterlony double diffusion. Agglutination reactions- Active, Passive agglutination and Hemagglutination. Complement system–Classical, Alternate and Lectin pathways. MHC– Structure of MHC I and MHC II. Humoral immunity- Development of B-cells-B cell receptor- Activation and Production of Antibodies. Cell mediated immunity Development of T-cell- T-cell receptors-types of T-lymphocytes-Activation of T-cell. Cytokines General Properties, functional categories Interferons

UNIT-IV 12Hrs

Hypersensitivity–Type I, Type II, Type III and Type IV. Vaccines -Introduction to Vaccines and Adjuvants - Types of vaccines – Killed and Live Attenuated vaccines. Sub–unit vaccines, conjugate vaccines, Toxoids. Recombinant vector vaccines. Immunization: Passive and active immunization

ReferencBooks:

1. Kuby Immunology
2. Janeway'sImmunobiology(KennethM.Murphy,CaseyWeaver)
3. BasicandClinicalImmunology(MarkPeakman,DiegoVergani)

.

B23HA0205	PATHOLOGY-II	L	T	P	C
		2	1	0	3

Course Objective

1.To learn about Basic hematology

2.To learn about about various blood cells

3.To understand about anemia and its types

4.To understand about the coagulation pathway

Course Outcomes

CO1. Acquire knowledge on about basis of hematology

CO2. Acquire knowledge about various blood cells its formation and morphology

CO3. Able to learn about the various types of anemia its causes and lab diagnosis

CO4. Able to learn about the coagulation cascade

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0205	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

UNIT-I 12Hrs

Blood collection Capillary and Venous blood. Vacutainers and its colour code anticoagulants Preparation of Blood smears(Thin smear, thick smear, wet preparations and buffy coat preparation). Bone marrow(Collection and preparation) Morphologic study of Marrow films. Haemocytometers Romanowsky stains (Leishman giemsa MGG wright, Wright and Wright giemsa stain) Supravital staining

UNIT-II 12Hrs

RBCs Structure and synthesis of Haemoglobin. WBC(Eosinophils basophils neutrophils monocytes lymphocytes) Differential count and platelets. Composition, function, preparation, and storage of various diluting fluids. Anisocytosis and poikilocytosis Estimation of Haemoglobin Principles, techniques Normal and abnormal hemoglobin Sickling test hb electrophoresis Principles and methods of determining ESR and PCV. Red Cell Indices (MCV, MCH, MCHC)

UNIT-III 12Hrs

ANAEMIA: Definition, classification of anaemia (iron deficiency megaloblastic sickle cell anemia megaloblastic perinicious thalassemia, haemolytic) Laboratory diagnosis Polycythaemia vera Leucocytosis, Leucopenia, Eosinophilia, Neutrophilia neutropenia Basophilia basopenia , Lymphocytosis, Monocytosis, LEUKAEMIA: Definition and classification of Leukaemia Blood and Bone marrow findings in Acute Myeloid Leukaemia (AML) Acute Lymphatic (ALL) Chronic Mycloid Leukaemia(CML), Chronic lymphatic Leukaemia(CLL),. Multiple myeloma. Cytochemistry – Peroxidase, PAS, esterase, Perl's Staining

UNIT-IV 12Hrs

Coagulation factors, mechanism of blood coagulation, Fibrinolytic system, Disorders of coagulation. Laboratory methods used in the investigation of hemostasis (automated and manual method) Clotting time, Bleeding time, Partial Thromboplastin time, prothrombin time, and INR. Thrombin time, and Test for fibrinogen degradation product(d-dimer) Platelet function test.

Reference Books:

1. Essentials of Anatomic Pathology by Liag Cheng (2006)
2. Pettit JE and Hoffbrand AV. Essential Haematology. (Latest edition.) Blackwell Scientific
3. Goodright SH, Hathaway WE Disorder of Haemostasis and Thrombosis- A Clinical Guide. Latest

B23HA0206	HUMAN PHYSIOLOGY	L	T	P	C
	(Practical)	0	0	2	2

Course Objective

1.To understand about the importance of capillary and venous blood collection

2. To know and determine bleeding and clotting time

3.To understand blood pressure monitoring and Pulse reading

4.To know about blood grouping and identification of blood cells

Course Outcomes

After completing the course the student shall be able to:

CO1. Able to Perform venous blood collection

CO2. Able to perform and determine bleeding and clotting time

CO3. Handle blood pressure apparatus and monitoring it

CO4. Learn and differentiate various blood groups

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0206	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

1. Capillary and venous blood collection .
2. Determination of Clotting Time, Bleeding Time
3. Blood pressure Recording and pulse reading
4. Determination of Blood Groups by ABO blood grouping
5. Identification of blood cells by leishman stain

B23AS0207	TREE PLANTATION VANAMOHTSAVA	L	T	P	C
		0	0	1	1

Course Description: This course introduces significance of trees that provide us with a great many ecosystem services, including air quality improvement, energy conservation, stormwater interception, and atmospheric carbon dioxide reduction. These benefits must be weighed against the costs of maintaining trees, including planting, pruning, irrigation, administration, pest control, liability, cleanup, and removal. Students are expected to involve in planting a tree and nurturing till the completion of their degree program. Successful maintenance of tree is considered to be one of the eligibility criterions for the award of university degree. This course is a part of "**REVA Vanamahotsava – One Student, One Tree"**

COURSE OBJECTIVE (S):

The Course objectives are to

1. Develop basic understanding of role of trees in climate change
2. Emphasize on the selection and placing a tree for maximum benefit to environment
3. Involve in planting a tree and nurture till the completion of the degree program
4. Generate experiential report on the tree plantation process involved

Course Outcome

CO1 Interpret the possible key benefits of trees arresting climate change and global warming

CO2 Develop the ability to identify the type of a tree to be planted in urban areas, agricultural fields and forestry areas

CO3 Make use of reading different literature on climate change and global warming by adopting various reading strategies

C04 Take part in planting a tree and nurturing it and Generate report on tree plantation process involved

Course Contents

Unit 1: Introduction: The tropical region, Benefits and costs of urban and community forests

Unit 2: General Guidelines for Selecting and Placing Trees: Guidelines for Energy Savings, Guidelines for Reducing Carbon Dioxide,

Guidelines for Reducing Stormwater Runoff, Guidelines for Improving Air Quality Benefits, Guidelines for Avoiding Conflicts with Infrastructure, Guidelines for Maximizing Long-Term Benefits, Trees for Hurricane-Prone Areas

Activity based learning Every student has to thoroughly understand the significance of planting a tree, identify type of tree and place to be planted, plant a tree and nurture till the completion of the degree.

Summary of Internal Assessment, Semester End Examination and Evaluation Schedule is provided in the table given below (for theory courses having Credit 1).

Summary of Internal Assessment and Evaluation Schedule

Sl. No.	Type of Assessment	When	Syllabus Covered	Max Marks	Reduced to	Date by which the process must be completed
1	Test-1	During 8th Week	First 50%	25	12.5	8th week
2	Test -2	During 15th Week	Remaining 50%	25	12.5	15th Week
3	SEE	18th to 20th Week	100%	50	25	20th Week

Text Books:

1. Kelaine E. Vargas, E. Gregory McPherson, James R. Simpson, Paula J. Peper, Shelley L. Gardner, and Qingfu Xiao, "Tropical community tree guide: Benefits, Costs and Strategic Planting", U.S. Department of Agriculture, Forest Service Pacific Southwest Research Station Albany, California, 2008

Reference Books:

1. Peter Wohlleben, The Heartbeat of Trees, Penguin Books, 2021
2. Daniel Chamovitz, "What a Plant Knows: A Field Guide to the Senses", 2020

SEMESTER-III

B23HA0301	BIOCHEMISTRY-III	L	T	P	C
		2	1	0	3

Course objectives

1. To understand about the carbohydrate metabolism
2. To understand about the protein metabolism
3. To Understand about the lipid metabolism
4. To Understand about the basic concept of nucleic acids

Course outcomes

CO1. Gain knowledge on carbohydrate metabolism and disorders

CO2. Understand the protein metabolism

CO3. Understand lipid metabolism and disorders

CO4. Gain knowledge on of nucleic acids

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0301	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

CARBOHYDRATE METABOLISM : types of metabolic pathways (Anabolic pathways Catabolic pathways) Pentose phosphate pathway Glycogenesis Gluconeogenesis Glycolysis Kreb's cycle Oxidative phosphorylation Glycogenolysis Hormonal regulation of Blood Glucose, Hyper glycemia & Diabetes Mellitus, Diabetic Ketoacidosis, Glycosuria, Hypoglycemia, Pentosuria, fructosuria, galactosemia & Glycosylated Hemoglobin. Investigation of disorders of carbohydrate metabolism: glucose, Glucose tolerance tests & other tolerance tests

UNIT-II 12Hrs

Protein Biosynthesis Metabolism of individual amino acids. Catabolism of Amino Acids, Formation of Ammonia, Transamination and Oxidative deamination. Urea Cycle. Formation of Creatine Conversion of amino acids to specialized products. Principles and methods for the estimation of Urea, creatinine, Total protein and Albumin.

UNIT-III 12Hrs

METABOLISM OF LIPIDS : Fatty acid synthesis Ketogenesis. Biosynthesis of Triglycerides, Biosynthesis of cholesterol & Bile Acids, Plasma Lipoproteins, Apo lipoproteins & Lipoprotein metabolism Obesity, Fatty Liver, Lipotropic factors and ketosis PUFA , Estimation of lipids-Cholesterol, Triglycerides, HDL LDL VLDL Colorimetric and enzymatic method.

UNIT-IV 12Hrs

Biosynthesis of Purine and Pyrimidine nucleotides, denovo and salvage pathway central dogma Degradation of purine and pyrimidine nucleotides Principles & methods for the estimation of Uric acid VITAMINS AND MINERALS : Vitamins definition classification and its role fat soluble and water soluble vitamins (Vitamin A B complex vitamins vitamin C D E K) minerals definition calcium, phosphorus, potassium, sodium, chloride, iron)

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

B23HA0302	MICROBIOLOGY-III	L	T	P	C
		2	1	0	3

Course objectives

1. To learn about the normal flora of the human body and Pathogenic Gram positive bacteria
2. To learn about the morphology disease causing and lab diagnosis Pathogenic Gram positive bacilli
3. To learn about morphology disease causing and lab diagnosis Pathogenic Gram negative cocci
4. To learn about morphology disease causing and lab diagnosis Pathogenic Gram negative bacilli

Course outcomes

CO1. Gain knowledge on normal flora and disease causing organisms
CO2. Acquire the knowledge of infections caused Gram positive bacilli
CO3. Gain knowledge about morphology, pathogenicity, clinical features and lab diagnosis of Gram negative cocci
CO4. Able to learn the morphology, pathogenicity, clinical features and lab diagnosis of Gram negative bacilli

Mapping of Course Outcomes with programme Outcomes

Course Code	POS /	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PO 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PSO 3

	COs															
B23HA0302	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

Unit: 1 Introduction to normal flora bacteria Morphology, diseases caused antigenic properties of gram positive cocci Staphylococci (S.aureus S.epidermidis S.saprophyticus)Streptococci classification (S.pyogenes S,pneumoniae S.agalactiae Enterococci Micrococci) isolation of organisms from the clinical samples lab diagnosis and treatment

UNIT-II 12Hrs

Introduction to gram positive bacilli Morphology, diseases caused antigenic properties of gram positive bacilli Bacillus (B.anthracis)Corynebacterium (C.diptheriae) Clostridium(C.perfringens C.tetani) Listeria (L.monocytogenes) Mycobacterium Actinomycetes Nocardia isolation of organisms from the clinical samples lab diagnosis and treatment

UNIT-III 12Hrs

Introduction to gram negative cocci and gram variable cocci Morphology, diseases caused antigenic properties Moraxella (M.catarrahalis)Acidaminococcus, Megasphaera, and Veillonella. Gram negative diplococci Neisseria (N.gonorrheae N.meningitis) isolation of organisms from the clinical samples lab diagnosis and treatment

UNIT-IV 12Hrs

Introduction to gram negative bacilli Enterobacteriaceae classification Morphology, diseases caused antigenic properties (Bacteroides fusobacterium vibrio Aeromonas Pleisomonas Pasturella E.coli Citrobacter Klebsiella Enterobacter Serratia Proteus Morganella Providencia Salmonella Shigella Yersinia Stenotrophomonas Pseudomonas Campylobacter Helicobacter Brucella Hemophilus) isolation of organisms from the clinical samples lab diagnosis and treatment

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.1

B23HA0303	PATHOLOGY -III	L	T	P	C
		2	1	0	3

Course objectives

1. To understand the basics of clinical pathology and various sample collection
2. To understand the importance of stool collection and diagnosis
3. To understand the basics of sterile body fluids and collection
4. To understand the importance of diagnosis in sterile body fluids

Course outcomes

CO1 : Acquire knowledge on basics of clinical pathology and urine collection
CO2: Acquire knowledge on stool collection and understanding the importance of collection
CO3:Gain knowledge on various sterile body fluids function and its diagnosis
C04: Gain knowledge on microbiology biochemistry and cell counting of all the body fluids

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0303	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

Method of urine collection, Microscopical examination of urine, collection of urine and its preservation,Colour, cloudiness, specific gravity, reaction, pH Different methods for detection, importance and its interpretation of – Protein, Sugar, Bile pigment, Bile salt, Urobilinogen, ketone bodies, Bence-Jones protein & Blood Examination and identification of sediment for: various cells, crystals, casts Pregnancy test-Production of HCG, HCG level at various stages of pregnancy, pregnancy test, Different types of pregnancy test such as Gravindex test& card test

UNIT-II 12Hrs

Collection and Examination of stool sample for color, mucous, consistency, ova, cyst, Parasites, Pus cells, RBCs & crystals. Detection of occult blood in stool, measurement of fecal urobilinogen & fecal fat, their importance interpretations.Semen Methods of collection, Macroscopic and microscopic examination of semen, Motility, count, other findings. Staining and morphological studies of spermatozoa, importance & interpretation

UNIT-III 12Hrs

Collection and transport, bone marrow. Collection of CSF and Transportation Collection of peritoneal fluid and Transportation Collection and Transportation of pericardial fluid Collection and Transportation of sputum Collection and Transportation of BAL Collection and Transportation of synovial fluid Collection and Transportation of pleural fluid Collection and Transportation of amniocentesis Procedure Collection of of chorionicvillus sampling

UNIT-IV 12Hrs

Biochemistry(glucose protein)hematology (cell count abnormal cells present)microbiology analysis (various pathogens affecting) Histopathology and cytology analysis of Pericardial fluid Peritoneal fluid Cerebrospinal fluid Sputum BAL Synovial fluid pleural fluid

References:

1. Robbins and Cotran Review of Pathology by Klatt and Kumar
2.Robbins Basic Pathology(Abbas Aster Kumar

B23HA0304	BIOCHEMISTRY IN DAILY LIFE (OPEN ELECTIVE)	L	T	P	C
		2	0	0	2

Course Objectives

1. To understand about micronutrients, water vitamins and minerals
2. To understand about the diseases affecting the liver and kidney
3. To impart knowledge about various diseases and prevention
4. To understand about the various markers useful in diagnosis

Course Outcomes

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

CO2 Gain knowledge on the causes, symptoms of various diseased conditions and their prevention.

CO3 Acquire active knowledge on Diseases affecting the gastrointestinal system and HIV

CO4 Acquire active knowledge on the importance of lab diagnosis

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B22HA0304	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

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

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

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

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. Practical Clinical Biochemistry, ed. Harold Varley, 4th edn. CBS Publishers (1988).
2. Practical Clinical Biochemistry: Methods and Interpretation, ed. Ranjna Chawla, JaypeeBrothers Medical Publishers (1996).
3. Hepatology- A clinical text book by k Mauss, Berg, Rockstroh, Sarrazin, Wedemeyer H (2017)
4. Hepatology: a Textbook of Liver Disease, 4th edition by Zakim, Boyer 2003.
5. Text book of Diabetes 5th edition by Richard I. G. Holt, Clive Cockram, Allan Flyvbjerg, Barry J. Goldstein John Wiley & Sons 2011.

B23HA0305	SKILL DEVELOPMENT (HEALTH CARE)	L	T	P	C
		2	0	0	2

Course Objective

1. Know the principles of Communication for health and educating the patients for acute andchronic diseases.
2. To understand about Personal hygiene and environmental Protection

Course Outcome

CO1. Develop the awareness of health care system in various aspects.
CO2. Able to aware about environment sanitation and maintaining the hygenic condition.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0305	CO1	2	1	1	1				2	2	1	1
	CO2	2	1	2	1	2			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

B23HA0306	BIOCHEMISTRY-I (Practicals)	L	T	P	C
		0	0	2	2

Course Objective

1. To learn about the measurement of liquids and preparation of solutions
2. To learn about the preparation of buffers
3. To learn about the maintanance of analytical balance centrifuge and ph meter
4. To learn about titration of acids

Course Outcomes

CO1. Acquire knowledge about the measurement of liquids and preparation of solutions
CO2. Achieve knowledge on preparation of buffers used in biochemistry
CO3. Acquire knowledge about the maintanance of analytical balance centrifuge and ph meter used in biochemistry
CO4. Acquire knowledge about the titration of various solutions
.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0306	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

Course Contents

1) Calibration of pipette
2) Preparation of different percentage solutions, Molar and Normal solutions

3) Preparation of buffers
4) Use and proper maintenance of -Analytical balance, Electronic balance, Centrifuge, Colorimeter, spectrophotometer, pH meter, Homogenizer, Desiccators
5) Qualitative analysis of carbohydrates
6) Qualitative analysis of proteins and amino acids
7) Protein precipitation, and separation of proteins

B23HA0307	PATHOLOGY-I(Practicals)	L	T	P	C
		0	0	2	2

Course objective

1.To understand about Romanowsky staining solutions and diluting fluid for cell counts
2.To understand about thick and thin smears and Haemoglobin estimation
3. To understand about ESR determination RBC count WBC count Differential count
4.To understand about Platelet count Absolute eosinophil count and Recticulocyte count

Course outcomes

CO1. Gain knowledge on Romanowsky staining solutions such as leishmann stain and diluting fluid for cell counts

CO2. Gain knowledge on thick and thin smears staining and Haemoglobin estimation

CO3. Acquire the knowledge about RBC count WBC count Differential count and its significance

CO4. Acquire the knowledge about platelet count and its clinical significance

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0307	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

- Romanowsky staining solutions
- Preparation of diluting fluids for cell counts.
- Preparation of thick and thin smears and their staining
- Haemoglobin estimation- cyan methaemoglobin method and Sahli's method
- ESR determination
- RBC count
- WBC count
- Differential count
- Platelet count
- Absolute eosinophil count
- Recticulocyte count
- PCV, Red cell indices.

B23HA0308	MICROBIOLOGY-I (Practicals)	L	T	P	C
		0	0	2	2

Course objective

1. To understand about microscope and other devices used in microbiology laboratory
2. To understand about sterilization of glass wares.
3. To understand about the Principle and working of Hot air oven, Laminar air flow
4. To understand about preparation of media and staining

Course outcomes

CO1. Gain knowledge on microscope its working principle and its types

CO2. Gain knowledge on sterilization Principle and its uses .

CO3. Get knowledge Principle and working mechanism of Hot air oven, and Laminar air flow

CO4. Gain knowledge on various media preparation staining overview various stains used in bacteriology lab

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0308	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 Contents

1. Demonstration of Microscope and its parts
2. Demonstration of glassware used in microbiology autoclave and sterilization of glass wares.
3. Demonstration of Hot air oven, Laminar air flow
4. Preparation of media biochemical tests and preparations of slants and isolation of microorganisms and morphology
5. Preparation and fixation of smears staining such as gram staining AFB endospore Capsule
6. Motility test by hanging drop and observation of microorganisms under the microscope

B23HA0309	**CLINICAL POSTINGS-II**	**L**	**T**	**P**	**C**
		0	0	2	2

Students will undergo clinical posting in various hospitals in respective labs . Also develop the ability to recommend and interpret appropriate diagnostic studies/findings

7.

SEMESTER-IV

B23HA0401	PATHOLOGY -IV	L	T	P	C
		2	1	0	3

Course objectives

1.To understand the concepts of blood banking and transfusion medicine

2.To understand about the donor process and screening for blood donation

3.To understand the importance of ABO blood grouping

4.To understand the tests involved before transfusion process

Course outcomes

CO1. Acquire active knowledge on blood banking and collection methods

CO2. Acquire active knowledge on donor screening and various tests involved in it

CO3 Acquire active knowledge on ABO blood grouping and minor blood groups

CO4. Gain knowledge on compatibility tests

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / Cos	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0401	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

General introduction to Blood Banking collection of blood by phelebotmy and apheresis (plasmapheresis platleletpheresis)method various components of blood used in transfusion medicine instruments and equipments used in blood banking blood bags anticoagulants used and types of blood bags NACO DGHS IRC services

UNIT-II 12Hrs

Screening of Donors: Physical and clinical Examination. Haemoglobin, Screening for Parasitic infections – Malaria, Filaria. VDRL test, Screening for HBs Ag, HCV and HIV. Temperature for storage of Blood. Preservation / storage of Blood. Transport of Blood Instruments and equipments used in blood banking

UNIT-III 12Hrs

Blood group and its inheritance. ABO blood group system and its distribution. General introduction to Rh system. Preparation of sera. ABO grouping methods and factors influencing(Tube , slide, column). Forward grouping Reverse grouping Rh-typing methods MNs blood group system. P-Blood group system. Lutherman Blood group system. Kell Blood group system, Lewis Blood group system. Duffy Blood group system, Bombay Blood group. preparation and Storage of anti sera.

UNIT-IV 12Hrs

ABO and Rh Haemolytic disease of new born and principle of coomb's test - Direct and indirect their method and applications. Compatibility test in blood transfusion its applications.(Major and Minor cross matching)

Reference Books:

1.Essentials of Blood Banking and Transfusion Medicine Ganga S. Pillai
2.Transfusion medicine and hemostasis H.Shaz

B23HA0402	MICROBIOLOGY-IV	L	T	P	C
		2	1	0	3

Course Objectives

1.To learn the fundamental aspects of parasites types of hosts and general characters

2.To learn about the classification of parasite

3.To learn about platyhelminthes its features and diseases caused

4. To learn about Nemathelminthes its features and diseases caused

Course outcomes

CO1. Gain knowledge on parasites types of hosts and general characters significance

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 platyhelminthes and their morphology, pathogenicity, clinical features and lab diagnosis

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

Mapping of Course Outcomes with programme Outcomes

Course Code	POS /	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3

	COs												
B23HA0402	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 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-II 12Hrs

Classification, general morphology, biology, mode of transmission, pathogenicity,
laboratory diagnosis and prophylaxis cryptosporidia microsporidia isospora cestodes Diphyllobothrium Taenia solium and echinococcus Classification, general morphology, biology, mode of transmission, pathogenicity, Classification, general morphology, biology, mode of transmission, pathogenicity, laboratory diagnosis and prophylaxis trematodes Fasciola,schistoma nematodes enterobius Ascaris **laboratory diagnosis and prophylaxis trematodes Fasciola,schistoma nematodes enterobius Ascaris**

UNIT-III 12Hrs

Introduction to Mycology A brief study of classification of fungi Morphology of fungus, yeasts, yeast like fungi Dimorphic fungi, Filamentous fungi Reproduction of fungus Types of specimens, its collection, transportation, Preservation and processing for the diagnosis of fungal infections Basic knowledge of different types of fungal infections its causative agents and its epidemiology. Superficial mycoses Subcutaneous mycoses Systemic mycoses Opportunistic pathogens and its infections

UNIT-IV:

Morphology identification and sensitivity Candida species, Cryptococcus, Sporothrix, Blastomyces,Paracoccidioides brasiliensis,Coccidioides immitis, Histoplasma, Agents of Chromomycosis, Penicillium, Fusarium, Cladosporium, Curvularia, Rhizopus, mucor, Aspergillus, Trichoderma species, streptomyces, Syncephalastrum, and Cephalosporium

References:

1. Medical Parasitology – AjitDamle
2. Text Book of Parasitology by K.D. Chatterjee, Chatterjee medical Publishers,
3. Text book of Medical Parasitology by S.C. Parija.

B23HA0403	BIOCHEMISTRY -IV	L	T	P	C
		2	1	0	3

Course objective

1. To understand about Spectroscopy
2. To understand about electrophoresis
3. To Understand about chromatography
4. To understand about radioactivity

Course outcomes

CO1. Understand the concept of Spectroscopy its types and mechanism of working

CO2. Learn about the basic and application of electrophoresis

CO3. Ascertain the knowledge about Chromatography its types

CO4. Gain knowledge about radioactivity

Mapping of Course Outcomes with programme Outcomes

Course Code	POS /	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3

	Cos												
B23HA0403	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 12 hrs

Spectroscopy: Properties of light (absorption, transmission, refraction, reflection, phase formation, scattering, interference), Beers- Lambert law; Principle, instrumentation and theory and applications of UV-visible, IR, ESR, mass, MALDI, NMR spectrophotometry; fluorimetry, CD; X-ray diffraction, X-ray crystallography, surface plasmon resonance.

UNIT-II 12 hrs

Electrophoresis: Principle, theory and applications of electrophoresis- paper, gel (starch, acrylamide and agarose), vertical, horizontal submarine, gradient, 2D-PAGE, pulse-field, capillary and isoelectric focusing; isolation, blotting techniques (southern, northern and western blotting) and their applications.

UNIT-III 12 hrs

Chromatography introduction types and modes of separation Paper thin layer HPTLC gas liquid HPLC and FPLC Spectroscopy Basic principles of electro magnetic radiation Beer lamberts law principle instrumentation and applications of colorimetry

UNIT-IV 12 hrs

Concept of radioactivity concept of alpha beta and gamma emitters applications of radioactive tracers in biology principles and applications of phosphor imager detection and measurements -GM counter Scintillation counter gamma ray spectrometers safety aspects biological applications radio dating isotope dilution technique autoradiography biosensors -Introduction to biosensors concept and applications biosensors for diabetes management noninvasive biosensors in clinical analysis

Reference Books:

1.Essentials of Clinical Mycology by Carol A. Kauffman, Peter G. Pappas and Jack D. Eds. Sobel

2.Introduction to Fungi by John Webster and Roland Weber

3.Fundamentals of the Fungi by Elizabeth Moore-Landecker

B23HA0404	PHARMACOLOGY	L	T	P	C
		2	0	0	2

Course objective

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	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0404	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

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)

B23HA0405	CLINICAL DATABASE MANAGEMENT-I	L 2	T 1	P 0	C 3

Course objectives

1.To understand about the concepts of clinical Data base Management

2.To understand about the guidelines of ICMR

3. To understand about the concepts of GLP guidelines

4. To understand about the concepts of Clinical trials

Course Outcomes

CO1. Learn to understand about pharmacology and concepts of Clinical data base managemet

CO2. Able to understand about pharmacology and concepts of ICMR and Therapeutics

C03. Able to understand about the concepts of GLP

C04. .Able to understand about Sponsors and Clinical trial

Mapping of Course Outcomes with programme Outcomes

Course Code	POS /	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3

	Cos												
B23HA0405	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-1 12 hrs

Introduction to Clinical Research Clinical Research: An Overview, Different types of Clinical Research. Clinical Pharmacology:Pharmacokinetics, Pharmacodynamics, Pharmacoepidomology, Bioavailability. Bioequivalence, Terminologies and definition in Clinical Research. Drug Development Process: Preclinical trail, Human Pharmacology (Phase-I)

Unit 2 12 hrs

Exploratory trail (Phase-II), Therapeutic Confirmatory Trail (Phase-III) and Post marketing surveillance (Phase-IV). Guidelines, Regulation and Ethics in Clinical Research Brief History of Clinical Research: Sulphanilamide Tragedy, Thalidomide Disaster, Nazi Experiments, Tuskegee Study, Belmont report, Nuremberg code, Declaration of Helsinki principles. Guidelines in Clinical Research-International Conference on Harmonization (ICH)

Unit 3 12 hrs

Guidelines for Good Clinical Practice, ICMR guidelines for Biomedical Research on Human Subject Regulation in Clinical Research- Drug and cosmetic act, FDA, Schedule-Y- Ethics Committee and their responsibilities. DCGI submission procedure. Other Regulatory authorities- EMEA, MHRA, PhRMA. Introduction: Concept of Clinical Trail Management, Stake holders in Clinical Trail project.

Unit 4 : 12 hrs

Sponsors perspective: Responsibility of Sponsors, Study Preparation Initial Documents and capability assessment, Study feasibility,Vendors/Service provider selection, Investigator selection ,Budgeting in Clinical trail, Clinical Trail Agreement(CTA),Regulatory submission and approval, Sponsors obligation in Good Clinical Practice.

Reference Books:

1. Lawrence MF, Curt DF, David LD (2010)
2. Fundamentals of clinical trials Tom Brody (2016). Clinical trials. Elsevier

B23HA0406	BIOCHEMISTRY-II (Practicals)	L	T	P	C
		0	0	2	2

Course Objectives

1. To understand about the diabetic profile
2. To understand about the Renal Profile
3. To understand about LDL VLDL and HDL
4. To understand about triglycerides

Course Outcomes

CO1. Perform and interpret the results of diabetic profile

CO2. Perform and interpret the results of creatnine and BUN

CO3. Perform and interpret the results of LDL VLDL and HDL

CO4. Perform and interpret the results of total cholesterol

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / Cos	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA040	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

Course Contents

1) Estimation of Random blood sugar fasting blood sugar PPBS and HbA1c
2) Estimation of urea
3) Estimation of creatnine and BUN
4) Estimation of LDL VLDL and HDL
5) Estimation of total cholesterol and triglycerides

B23HA0407	MICROBIOLOGY-II (Practicals)	L	T	P	C
		0	0	2	2

Course Objective

1. To understand about biochemical tests
2. To know various biochemical tests such as TSI MMM urease and String test
3. To know and understand Coagulase and oxidase test
4. To understand about the importance of Bile esculin test

Course Outcome

CO1**.** Ready to do Perform biochemical tests

CO2. Perform biochemical tests such as TSI MMM urease String test and interpret

CO3. Perform Coagulase and oxidase test and interpret the result

CO4. Perform Bile esculin test and interpret the result

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / Cos	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0407	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

Course Contents

1. Performing biochemical tests IMVIC
2. TSI MMM and urease
3. String test
4. Catalase test
5. Coagulase and oxidase test
6. Bile esculin test

B23HA0408	PATHOLOGY-II (Practicals)	L	T	P	C
		0	0	2	2

Course Objective

1. To know about the blood bank confirmatory tests
2. To understand about cross matching
3. To understand about latex agglutination tests
4. To understand about WIDAL Dengue and Malaria

Course Outcomes

CO1. Ready to Perform Forward grouping and reverse grouping and interpret the results

CO2. Ready to Perform Major cross matching and interpret the results

CO3. Ready to Perform CRP RPR RA ASO and interpret the results

CO4. Able to Perform WIDAL Dengue Malaria by rapid method and interpret the results

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / Cos	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0408	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 contents

1) Forward grouping and reverse grouping

2) Coombs test

3) Major cross matching

4) Estimation of CRP RPR RA ASO by latex agglutination

5) WIDAL Dengue Malaria by rapid method

B23HA0409	CLINICAL POSTINGS-II	L	T	P	C
		0	0	2	2

Students will undergo clinical posting in various hospitals in respective labs . Also develop the ability to recommend and interpret appropriate diagnostic studies/findings

SEMESTER -V

B23HA0501	MICROBIOLOGY-V	L	T	P	C
		2	1	0	3

Course objectives

1. To understand the basic concepts of virus Principles of virus, Taxonomy and classification
2. To understand about the Different methods of cultivation and isolation of viruses.
3. To Understand about the Collections, preservation, transportation specimens for viral diagnosis
4. To Understand about the Morphology identification of DNA virus

Course outcomes

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

CO2. Gain about the basic of Different methods of cultivation and isolation of viruses.

CO3. Acquire knowledge about Collections, preservation and diagnosis of viral specimens

CO4. Gain knowledge about the treatment of virus

Mapping of Course Outcomes with programme Outcomes

Course Code	POS /	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3

	COs												
B23HA0501	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 Contents

UNIT-I 12 hrs

General properties of viruses Structure of virus DNA virus RNA virus Morphology, Replication, effects of viruses on the host cells. Principles of virus, Taxonomy and classification. knowledge of medically important DNA and RNA viruses (Classification, Morphology, Pathogenicity, Host range, Methods of Laboratory diagnosis, prophylaxis and epidemiology)

UNIT-II 12 hrs

Different methods of cultivation and isolation of viruses. Animal inoculation Embryonated egg inoculation-Anatomy of embryonated egg, Techniques of various routes of inoculation Tissue culture techniques - Classification with examples - Cell culture containers and cleaning - Preparation of media, reagents and solutions - Propagation, maintenance, preservation of various cell cultures Description of common cell culture Contamination in cell culture - Detection of virus growth in cell culture - C.P.E, Metabolic inhibition, Haemadsorption, Interference, Immunofluorescence - Cytological and Cytochemical diagnostic methods - Inclusion bodies- methods of staining and demonstration

UNIT-III 12 hrs

Collections, preservations, Transportation, Processing, Isolation and identification of the following specimens for viral diagnosis. Skin lesion, Vesicle fluid, Biopsy specimens, C.S.F and other sterile fluids, pus, buffy coat, Nasopharyngeal secretions, sputum, Urogenital specimens Faeces or rectal swab

UNIT-IV 12 hrs

Morphology identification and treatment of DNA virus (Adenoviruses, Herpesviruses, Poxviruses, Parvoviruses, with suitable examples)RNA virus (Reoviruses, Picornaviruses, Togaviruses,

Orthomyxoviruses, Rhabdoviruses, and Retroviruses)oncogenic virus Epstein–Barr virus (EBV), hepatitis B virus (HBV), human T-lymphotropic virus 1 (HTLV-1), human papillomaviruses (HPVs)

References:

1. Basic Virology, Fourth Edition Martinez J. Hewlett, David Camerini, David C. Bloom
2. Principles of Virology Jane Flint, Vincent R. Racaniello, Glenn F. Rall, Theodora Hatziioannou
3. Principles of Virology, Volume 1 Jane Flint, Vincent R. Racaniello, Glenn F. Rall, Theodora Hatziioannou

B23HA0502	BIOCHEMISTRY -V	L	T	P	C
		2	1	0	3

Course Objective

1. To learn the fundamental aspects LFT
2. To learn the fundamental aspects GFT
3. To learn the fundamental aspects PFT
4. To learn about the fundamental aspects of hormonal profile

Course Outcome

CO1. Gain knowledge about liver profile panel its diagnosis

CO2. Acquire knowledge about gastric function tests diagnosis

CO3. Acquire knowledge about diseases affecting the pancreas and lab diagnosis

CO4. Acquire knowledge of hormonal imbalance and the tests associated with it

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0502	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 Contents

UNIT-I 12Hrs

Liver function tests(SGOT SGPT ALP Bilirubin direct indirect total albumin Globulin) Disease of the liver-Jaundice,acute and chronic hepatitis, Cirrhosis,Cholestasis etc
Kidney function tests (Urea creatinine BUN)Glomerular function and measurements, clearance tests, -Tubular function tests, clinical syndromes ABG

UNIT-II 12Hrs

Gastro intestinal function tests -Collection of Gastric Juice. Tests for Gastric Function, Stimulation methods-Test meals, Measurements of other Gastric Components, Malabsorption, Tests for occult blood in faces, Tests for malabsorption studies, Schilling test, D-xylose absorption test, faecal fat estimation. Estimation of free and total acidity

UNIT-III 12Hrs

Pancreatic function tests -Tests in Pancreatic diseases -Serum Enzymes and Urinary Enzymes -Direct stimulation tests and indirect stimulation of the pancreas-Sweat tests
Gonadal function tests disorders in males and females(hormonal profile tests)
Foetal placental function tests -Haemolytic disease of Newborns, biochemical assay for fetal lung maturity, Biosynthesis of Estriol , measurements and clinical applications.

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

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

B23HA0503	PATHOLOGY -V	L	T	P	C
		2	1	0	3

Course objective

1. To understand about histopathology and steps involved in processesing of a tissue
2. To understand about different methods of grossing
3. To understand about equipments used in histopathology
4. To understand about special stains

Course Outcomes

CO1. Gain knowledge about the steps involved in processesing

CO2. Gain knowledge about grossing fixation dehydration various chemicals and concentrations used

CO3 Gain knowledge about automatic and manual equipments handling and usage

CO4. Gain knowledge about staining principle procedure and interpretation

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0503	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 Contents

UNIT-I 12Hrs

Introduction to HistoPathology: Introduction equipments used 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

Grossing of tissues, sections, tissue processing and its steps, manual and automated method, components & principle of automatic tissue processor. Processing of bones and teeth, dehydration wax impregnation properties of wax Embedding media, its type and properties.

UNIT-III 12Hrs

Microtome, its type and working, various type of microtome,Microtome knives, its type and knife sharpening, Section cutting, fault and remedies, mounting and mounting media, advantages & disadvantages.Decalcification, decalcification methods, types of decalcifying fluid. Section adhesive. Cryostat, frozen sections of fresh, fixed and unfixed tissue, freeze drying, rapid frozen sections and staining

UNIT-IV 12Hrs

Staining: Principle and procedure H and E staining PAS (Periodic Acid Shiff) stain PAP staining Masons trichrome staining Congo red stain Verhoeff –van gieson stain Grocott-Gomori's Methenamine Silver (GMS) Prussian blue Bilirubin by hall's method Oil Red O stain warthin starry staining feulgen stain

Refrences

1.Diagnostic Pathology: Normal Histology Laura Lamps, Matthew Lindberg
2.Histologic Preparations: Common Problems and Their Solutions Richard Brown
3.Histology and Cell Biology Abraham Kierszenbaum, Laura Tres

B23HA0504	CLINICAL DATABASE MANAGEMENT-II	L 2	T 1	P 0	C 3

Course objectives

1.To understand about the concepts of CRO and CDMO

2.To understand about the guidelines of IB and clinical research

3. To understand about the concepts of QA and QC

4. To understand about the concepts of Pharmacovigilance

Course Outcomes

CO1. Learn to understand about Investigaton perspective and Ethics committee submission,

CO2. Able to understand about Clinical Research Operation, Monitoring and Clinical Evaluation

C03. Able to understand about the concepts of Essential Document preparation

C04. .Able to understand about Sponsors and Clinical trial Drug Regulatory Authorities- Drug policy in India,

Mapping of Course Outcomes with programme Outcomes

Course Code	POS /	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3

	Cos												
B23HA0504	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

Unit 1 :12 hrs

Investigator perspective: Investigators obligation outlined in Good Clinical Practice,Recruitment, Retention and Compliance of study subjects, Ethics committee submission, adverse event and safety reporting. Contract Research Organization (CRO), Site Management Organization (SMO), Central Lab, Clinical Data Management Organization(CDMO), Medical Writing Organization, Logistic Management Organization, Pharmacovigilance Organization.

Unit 2:12 hrs

Clinical Research Operation, Monitoring and Clinical Evaluation: Project management, Protocol in Clinical Research, Informed Consent, Case Report Form, Investigator's Brochure (IB), Selection of an Investigator and Site, Patient screening, Inclusion and exclusion criteria, Randomization, Blinding, Recruitment Techniques (materials and methods Ethics and Regulatory submission, Monitoring Visits

Unit 3 : 12 hrs

Essential Document preparation (IB, ICF, PIS, TMF, ISF, CDA.CTA etc). GMP, GLP, QA and QC (Quality Management): International GMP regulation, Indian GMP regulation, Quality assurance in Pharmaceutical Industry, GLP principles: Organizational and personal, Quality assurance program, facilities, Equipments, Standard Operating Procedure, Performance of study reporting of results, storage of records and reports. Responsibility of Clinical Research Professionals:Investigator, Project Manager, Regulatory Affairs Associate, Medical Writer, Clinical Research Associate, Clinical Research Coordinator and Safety Report Associate.

Unit-4 12 hrs

Clinical data management systems, , Electronic data capture systems, Choosing vendor products, Implementing new systems, System validation, Test procedures, Change control, Coding dictionaries, Migrating and archiving Legacy Data, Phamacovigilance-Safety specification and risk management plan, Drug Hypersensitivity, Guidelines in Phamacovigilance. Drug Regulatory Authorities- Drug policy in India, Regulation on alternative system of Medicine, Safety of Herbal medicines, Medical and Scientific writing.

B23HA0505	BIOCHEMISTRY- III (Practicals)	L	T	P	C
		0	0	2	2

Course Objective

1. To understand about liver panel tests
2. To understand about Infertility profile and electrolytes
3. To understand about anemic profile
4. To understand about cardiac profile and thyroid profile

Course Outcomes

CO1: To understand about SGOT SGPT ALP bilirubin principle automation and procedure

CO2: To understand about Infertility profile and electrolytes principle automation and procedure

CO3: To understand about anemic profile principle automation and procedure

CO4: To understand about cardiac profile and thyroid profile principle automation and procedure

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0505	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 Contents

1. Estimation of SGOT SGPT ALP bilirubin(total indirect direct)
2. Estimation of albumin globulin protein (Albumin Globulin ratio
3. Infertility Profile
4. Electrolytes (sodium potassium chloride bicarbonate phosporous calcium)
5. Cardiac profile
6. Anemic profile
7. Thyroid profile

B23HA0506	MICROBIOLOGY-III (Practicals)	L	T	P	C
		0	0	2	2

Course objective

1. To understand about Preparation of Muller Hinton Agar and antibiotic Sensitivity manually
2. To understand about Isolation of fungi on SDA Preparation of KOH and examination of fungi by KOH
3. To understand about GT by yeast and performing sensitivity
4. To understand about Examination of fungus by LPCB and slide culture

Course outcome

CO1. Acquire the knowledge on media preparation and perform sensitivity forbacteria

CO2. Acquire the knowledge on Isolation of fungi and ready to perform sensitivity

CO3. Acquire the knowledge about yeast identification and sensitivity

CO4. Acquire the knowledge and ready to perform Examination of fungus by LPCB and slide culture

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0506	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 contents

1. Preparation of Muller Hinton Agar and peptone Water
2. Performing antibiotic Sensitivity manually
3. Isolation of fungi on SDA
4. Preparation of KOH and examination of fungi by KOH
5. Examination of GT by yeast and performing sensitivity
6. Examination of fungus by LPCB and slide culture

B23HA0507	PATHOLOGY-III (practicals)	L	T	P	C
		0	0	2	2

Course Objective

1.To understand about the importance of urine analysis

2. To understand about the macroscopic examination of urine

3. To understand about stool analysis

4. To understand about occult blood test

Course Outcome

CO1. Ready to Perform urine analysis and interpret the results

CO2. Ready to Perform and interpret the urine microscopic analysis

CO3. Ready to Perform stool analysis and gain knowledge about the importance

CO4 Ready to Perform occult blood test and interpret the result

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0507	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 contents

1. Urine analysis by strip method
2. Urine analysis gross examination
3. Microscopic appearance of casts crystals in urine
4. Gross examination of stool
5. Tests for occult blood

B23HA0508	CLINICAL POSTINGS II	L	T		P	C
		0	0		2	2

Students will be able to able to learn about clinical pathology hematology and will have an hands on training in labs

SEMESTER-VI

B23HA0601	PATHOLOGY -VI	L	T	P	C
		2	1	0	3

Course Objective

1. To understand about cytology
2. To understand about Collection of sterile fluids
3. To understand about cytogenetics
4. To understand the importance of Chromosomal analysis

Course Outcomes

CO1. Gain knowledge about Cytology and its techniques

CO2. Able to perform laboratory tests on sterile fluids

CO3. Gain knowledge about cytogenetics

CO4. Able to Perform and interpret Chromosomal analysis

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0601	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 contents

UNIT-I 12Hrs

Introductions to Cytology. Fixation of Cytology specimens – various fixatives, pre fixation, coating and spray fixation, advantages and disadvantages. Fine Needle Aspiration Cytology and exfoliative cytology – Procedure and applications Cytospin technique

UNIT-II 12Hrs

Collection, preparation of gynaecological and non-gynecological specimens- exfoliative cytology(Gynecological vaginal, cervical, endocervical, endometrial Examination of Non-gynecological – sputum, bronchial, Body fluids (serous effusions), CSF, urine)Staining – Routine cytology stain Pap, MGG, Concentration technique in cytology - Centrifugation, cyto-centrifugation, membrane filters, cell blocks. Liquid based cytology monolayer preparation.

UNIT-III 12Hrs

Human sex chromosomes :Sampling staining and demonstration of Barr body. Reporting and interpreting Barr test. Demonstration of Y-chromosome, Origin and demonstration of drumstick, small clubs, sessile nodules and balloons. Drumstick count and its interpretation.
Karyotyping Methods of Chromosome analysis ,Banding techniques. Chromosome analysis with blood and bone marrow. Morphology of chromosome and their identification. Criteria for chromosome identification. Identification criteria of group to group of chromosome. Conventional designation.

UNIT-IV 12Hrs

Chromosome Defects Physiologic factors are influencing the aetiology of chromosome defects, Types of chromosome defects- Structural abnormalities and human autosomal syndromes. Philadelphia chromosome and chromosome changes in Neoplasia, abnormalities of sex chromosome at birth, at puberty and in adults. Turner's syndrome, Down's syndrome, Klinefelter syndrome, Advanced methods in cytogenetic – FISH, SKY.Chromosomal microarray

Reference Books:

1.Genetics: A Conceptual approach Pierce, B.A.

2. Genetics From Genes to Genomes Hartwell, L.H. et al.

3. Medical Cytogenetics By Mark Hon Fong

B23HA0602	MICROBIOLOGY-VI	L	T	P	C
		2	1	0	3

Course Objective

1. To understand about the air and water surveillance
2. To understandabout food surveillance
3. To understand about hospital Nosocomial Infection
4. To understand about Biomedical waste management

Course Outcomes

CO1. Gain knowledge about air and water surveillance

CO2. Gain knowledge about food surveillance

CO3 Gain knowledge about nosocomial infection and role of microbiology lab in controlling it

CO4. Differentiate biomedical waste and disposal

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0602	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 contents

UNIT- I 12Hrs

Bacteriology of air : Examination of Air-a brief review of microorganisms causing air borne diseases. Examination of air in theatre or cabinets. Different methods in detail.

Water bacteriology : Bacteriology of drinking water , Brief review of microorganisms causing water borne infections ,Examination of water- methods of collection of water and processing, Presumptive coliform count and confirmatory tests, Membrane filtration methods

UNIT- II 12Hrs

Microbiology of milk Milk born infections, Preparation media and reagents for the study of water, food, milk and air, Methylene blue test or phosphatase test, colony count test, Milk ring test, Turbidity test,

UNIT- III 12Hrs

Bacteriology of food and food borne diseases Examination of food and food products Nosocomial Infection: Introduction, sources and types of Nosocomial infection, Bacteriological surveillance of hospital environment. Role of Microbiology lab in control of nosocomial infection.

UNIT- IV12Hrs

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 Safety measures in Microbiology Laboratory.

References:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier

B23HA0603	BIOSTATISTICS AND MOLECULAR BIOLOGY	L	T	P	C
		2	1	0	3

Course objective

1. To understand the Principles of Bioststistics
2. To understand the Probability and Distribution
3. To understand about Molecular diagnostic techniques
4. To understand about: DNA sequencing, Microarray, Mass spectrometry UV spectroscopy

Course contents

CO1. Gain knowledge on Bioststistics

CO2. Gain knowledge Probability Distribution

CO3. Learn about the principle and procedure of Molecular diagnostic techniques and perform them

CO4. Learn about the principle and procedure laboratory technique for determining the exact sequence of nucleotides

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0603	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 Contents

UNIT-I 12 hrs

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 12 hrs

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 12 hrs

Introduction to recombinant DNA technology: Isolation of DNA Restriction and other enzymes used in recombinant DNA technology, agarose gel electrophoresis Cloning vectors, Transformation, Construction of genomic and cDNA libraries

Screening: Preparation of probes, Principles of hybridization-based techniques colony, Southern, Northern and in situ hybridizations, ELISA, and its types

UNIT-IV 12 hrs

Molecular diagnostic techniques relevant to medical microbiology. restriction fragment length polymorphism. PCR(introduction principle and procedure) and its modifications including nested PCR, QPCR Multiplex PCR. FISH DNA microarray

Basic principles and applications of the following techniques: whole genome sequencing DNA sequencing, Microarray, Mass spectrometry UV spectroscopy

Reference Books:

1. Molecular Biology of the Cell by Bruce Alberts
2. Molecular Biology of the Gene by James D. Watson
3. Cell Biology & Molecular Biology by N. Arumugam

B23HA0604	SOFT SKILL (Communicative Medicine)	L	T	P	C
		2	0	0	2

Course objective

1.To understand about principles of health Information System
2.To understand about integrated Health and development program.

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	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0604	CO1	1					3	2	2	2	1	1
	CO2						2		2	2		1

UNIT I:

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. 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 II:

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. 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. Clinical Epidemiology- the Essentials : Fletcher
4. Epidemiology and Management for Health Care for all: Sathe PV, Sathe AP

B23HA0605	PATHOLOGY -IV (Practicals)	L	T	P	C
		0	0	2	2

Course objective

1. To learn and perform Grossing and Fixation of Dehydration clearing and wax impregnation in

automatic tissue processesor of histopathology samples

2. To learn about the embedding by Paraffin wax
3. To learn about the Sectioning of tissues by microtomy
4. To learn about the Staining by H&E staining and PAP staining

Course outcomes

CO1. Ready to perform Grossing and Fixation of Dehydration clearing and wax impregnation in automatic tissue processesor of histopathology samples

CO2. Ready to perform embedding by Paraffin wax

CO3. Ready to perform Sectioning of tissues by microtomy

CO4. Ready to perform Sectioning of tissues by H&E staining and PAP staining

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0604	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 Contents

1. Grossing and Fixation of histopathology samples
2. Dehydration clearing and wax impregnation in automatic tissue processesor
3. Embedding by Paraffin wax
4. Sectioning of tissues by microtomy
5. Staining by H&E staining PAP staining and microscopy

B23HA0605	MICROBIOLOGY-IV (Practicals)	L	T	P	C
		0	0	2	2

Course objective

To know about Food Surveillance for the isolation of Pathogenic microorganisms

2.To know about Water Surveillance for the isolation of Coliforms

3.To know about Isolation of Pathogenic microorganisms from milk

4..To know about Air sampling

Course outcomes

CO1. Acquire knowledge on Food Surveillance for the isolation of Pathogenic microorganisms

CO2. Gain knowledge on Water Surveillance for the isolation of Coliforms

CO3. Learn and isolate Pathogenic microorganisms from milk

CO4. Acquire knowledge on Air sampling

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA0605	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		2	1	1

Course Contents

1) Food surveillance
2) Water Surveillance by MPN method
3) Isolation of microorganisms from milk
4) Air sampling
5) Culturing and identification of microorganisms for the above tests

B23HA0606	PARASITOLOGY (Practicals)	L	T	P	C
		0	0	2	2

Course Objectives

1. To learn about basis of parasitology techniques
2. To learn about the sedimentation and floatation from stool samples
3. To learn about the microscopic examination eggs
4. To learn about blood smears for malaria and microfilaria by giemsa stain

Course Outcomes

CO1. Gain knowledge about parasitology techniques

CO2. Gain knowledge about sedimentation and floatation from stool samples and interpret the results

CO3. Differentiate various cysts and eggs

CO4. Ready to perform and interpret blood smears for malaria and microfilaria

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO 1	P 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PSO 1	PSO 2	PSO 3
B23HA060	CO1	1	3	3	2	--	1	1	1	1	2	2
6	CO2	1	3	3	2	--	1	1	1	2	1	2
	CO3	1	3	3	2	--	1	1	1	2	1	1
	CO4	1	3	3	2	1	1	1	1	2	1	**1**

Course Contents

1) Isolation of ova and cysts from stool samples
2) Sedimentation technique
3) Floatation technique
4) Microscopic examination of adult worms ova
5) Examination of blood smears for malaria and microfilaria by giemsa stain

B23HA0607	INTERNSHIP	L	T	P	C
		0	0	7	7

The students will be posted for three months in a hospital or diagnostics where they handle the patients perform tests and interpret the results

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 Dean 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

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