

10 YEARS
OF UNIVERSITY
RECOGNITION
20 YEARS OF
ACADEMIC
EXCELLENCE



REVA
UNIVERSITY
Bengaluru, India

SCHOOL OF APPLIED SCIENCES

B.Sc. – MICROBIOLOGY,
CHEMISTRY, GENETICS

HANDBOOK: 2021-22

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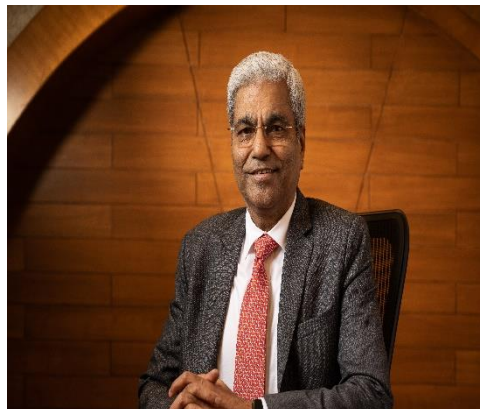
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Chancellor's Message

“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

Vice-Chancellor's Message

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



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

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

At REVA University, research, consultancy and innovation are regarded as our pillars of success. Most of the faculty members of the University are involved in research by attracting funded projects from various research level organizations like DST, VGST, DBT, DRDO, AICTE and industries. The outcome of the research is passed on to students through live projects from industries. The entrepreneurial zeal of the students is encouraged and nurtured through EDPs and EACs.

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

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

Welcome to the portals of REVA University!

Dr. Dhanamjaya M

Vice Chancellor, REVA University.

Director's Message

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 a greater number of teachers and professors to work in schools and colleges. Research has also been given equal importance. Private sector and Corporates are also looking for smart science graduates in a big way. The B.Sc. (CMG) degree program of REVA University is designed to prepare biotechnologist, biochemists, Microbiologist, genetists, scientists, teachers, professionals & administrators who are motivated, enthusiasts & 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. Maximum number of courses are integrated with cross cutting issues, relevance to professional ethics, gender, human values, environment and sustainability. The curriculum caters to and has relevance to local, national, regional and global developmental needs. 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. (CMG) 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 you and all students' pleasant stay in REVA and grand success in your career.

Prof. Shilpa BR

Deputy Director, SoAS

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 11,000 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 7th February, 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 Sensor 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, Oklahoma State University, Western Connecticut University, University of Alabama, Huntsville, Oracle India Ltd, Texas Instruments, Nokia University Relations, EMC², VMware, SAP, Apollo etc, to facilitate student exchange and teacher-scholar exchange programs and conduct training programs. These collaborations with foreign universities 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 won medals 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 APPLIED SCIENCES

The School of Applied Sciences offers graduate and post graduate programs in Biotechnology, Biochemistry, Chemistry, Physics and Mathematics 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 B.Sc. degree programs in Bio-Chemistry, Bio-Technology, Chemistry, Physics, Mathematics and B Sc with various combinations viz, Biotechnology, Biochemistry and Genetics, Physics Chemistry and Mathematics, Microbiology, Chemistry and Genetics, Mathematics, Statistics and Computer Science, and Bioinformatics, Statistics & Computer Science and also Post Graduate Diploma in Clinical Embryology and Artificial Reproductive Technology. The school also facilitates research leading to PhD in Biotechnology, Biochemistry, Physics, Chemistry, Mathematics, and related areas of study.

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

Vision

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

Mission

- To achieve excellence in studies and research through pedagogy and support interface between industry and academia
- To create intellectual curiosity, academic excellence, and integrity through multidimensional exposure
- To establish state of the art laboratories to support research and innovation and promote mastery of science.
- To inculcate an ethical attitude and make students competitive to serve the society and nation.

BOS MEMBERS

Sl. No.	Panel Members
Chemistry	
1	Dr. Sanjeevarayappa C. Assistant Professor and Head Department of Chemistry GFGC, Yelahanka

Sl. No.	Panel Members
Microbiology	
1	Dr. Mahesh M, Chief Executive Officer, Azyme Biosciences Pvt. Ltd., Bengaluru, Karnataka, India
2	Dr. Basavaraj Girennavar Chairman and Managing Director, Criyagen Agri & Biotech Pvt. Ltd., Bengaluru,
3	Dr. Latha P, Chief Operating Officer, X-Cyton Pvt Ltd, Bengaluru.
4	Dr. Pannuru Padmavathi, Managing Director, DR Biosciences LLP, Bengaluru
5	Dr. Pasupuleti Visweswara Rao Associate Professor & Research Coordinator Department of Biomedical Sciences and Therapeutics Universiti Malaysia Sabah, Malaysia
6	Dr. Mahesh Yandigeri, Senior Scientist, Division of Genomic Resources, National Bureau of Agricultural Insect Resources (NBAIR), Hebbal, Bengaluru
7	Dr. G.B. Manjunatha Reddy, Scientist, ICAR - National Institute of Veterinary Epidemiology and Disease Informatics (ICAR – NIVEDI), Yelahanka, Bangalore
Sl. No.	Panel Members
Genetics	
1	Dr. Harini BP Professor, Center for Applied Genetics, Bangalore University, Bangalore.
2	Dr. N. Vijaya Shankar Senior Scientist, Aurigene Discovery Technology, Bengaluru
3	Dr.S. Basavarajappa Associate Prof in Zoology, Mysore University, Mysore

B. Sc **(Microbiology, Chemistry, Genetics)**

Programme Overview

B.Sc. Microbiology, Chemistry & Genetics at REVA University is a 3-year bachelor level course through six semesters. It is an arm of microbiology and chemistry that scientifically studies related to heredity, genes, and variations in living organisms. This combination familiarizes with the usage of living organisms in the field of medicine, genetics and chemical sciences. It is designed to aid the students to understand the importance of chemicals, microbiology and genetics to improve the quality of human life.

Programme Educational Objectives (PEOs)

PEO -1	Adopt strong foundation with skills, ethics, relevant training and education towards understanding life science.
PEO - 2	Apply appropriate tools and techniques for conducting scientific investigations to solve the problems in life science domain.
PEO – 3	Acquire higher degree of work in academics and research.
PEO – 4	Adapt lifelong learning with continuous improvement.

Programme Outcomes (POs)

- 1. Science knowledge:** Apply the knowledge of life science for the solution of complex problems in various domains including healthcare considering public health & safety and the cultural societal & environmental concerns.
- 2. Problem analysis:** Identify, formulate & analyse problems related to various domains of life sciences relevant to biotechnology, genetics and biochemistry.
- 3. Conduct investigations of relevant problems:** Use basic knowledge including analysis and interpretation of data, and synthesis of the information to provide valid conclusions and also to carry out the research procedures.
- 4. Modern tool usage:** To Create, select and apply appropriate techniques, resources and modern technology which in turn benefit the society.
- 5. Environment and sustainability:** Understand and implement environmental friendly approaches in life sciences to support sustainable development.
- 6. Ethics:** Apply ethical principles and commit to professional ethics, responsibilities and norms in Life Sciences.

- 7. Individual and team work:** Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
- 8. Communication:** Communicate effectively with the scientific community and with society at large. Be able to comprehend and document. Make effective presentations, and deduce clear instructions.
- 9. Project management and finance:** Demonstrate knowledge and understanding of life sciences and management principles and apply these to one's own work, as a member and leader in a team.
- 10. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

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

1. Develop knowledge and understanding of various subjects in Chemistry, Microbiology and Genetics.
2. Explain, design and analyse field related problems in the domains of Chemistry, Microbiology and Genetics.
3. Plan manufacturing process, handle instruments and test products in the field of Life Sciences.



Regulations – Bachelor Degree Programs Academic Year 2021-22 Batch

(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 “**REVA University Academic Regulations – Bachelor Degree Programs 2021-22 Batch subject to amendments from time to time by the Academic Council on recommendation of respective Board of Studies and approval of Board of Management**”
- 1.2 These Regulations shall come into force from the date of assent of the Chancellor.

2. The Programs:

These regulations cover the following Bachelor Degree Programs of REVA University offered during 2021-22:

B Com (Industry Integrated)
B Com (Honors)
BBA (Industry Integrated)
BBA (Honors)
BBA (Entrepreneurship)
BA - Journalism, English, Psychology
BA - Tourism, History & Journalism
BA - Political Science, Economics & Journalism
BA - Performing Arts, English Psychology
BCA
BSc (Honours) Cloud Computing & Big Data
BSc in Physics, Chemistry, Maths
BSc in Maths, Statistics, Comp Sci.
BSc in Bioinformatics, Statistics, Computer Science
BSc in Biotechnology, Biochemistry, Genetics
BSc in Microbiology, Chemistry, Genetics
BSc in Physics, Maths, Computer Science

3. Duration and Medium of Instructions:

- 3.1 **Duration:** The Bachelor Degree program is of 6 Semesters duration. A candidate can avail a maximum of 12 semesters - 6 years as per double duration norm, in one stretch to complete the Bachelor Degree, including blank semesters, if any. Whenever a candidate opts for blank semester, s/he has to study the prevailing courses offered by the School when s/he resumes his/her studies.
- 3.2 The medium of instruction shall be English.

4. Definitions:

- 4.1 Course: “Course” means a subject, either theory or practical or both, listed under a program; Example: “Microbiological techniques” in B.Sc. (CMG) program is an example of course to be studied under respective program.**

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

L	Lecture
T	Tutorial
P	Practice

Where:

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

T stands for **Tutorial** session consisting participatory discussion / self-study/ 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 / Project Based Learning or Course end Project/Self Study/ Online courses from listed portals that equip students to acquire the much-required skill component.

4.2 Classification of Courses

Courses offered are classified as: Foundation Courses, Core Courses, Hard Core Courses, Soft Core Courses, Open Elective Courses, SEC, Project work/Dissertation

- 4.2.1 Foundation Course:** The foundation Course is a mandatory course which should be completed successfully as a part of graduate degree program irrespective of the program of study

- 4.2.2 Hard Core Course (HC) simply core course:** 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

4.2.3 Soft Core Course (SC) (also known as Professional Elective Course)

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

4.2.4 Open Elective Course (OE):

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 **Open Elective Course**

4.2.5 Project Work / Dissertation:

School can offer project work/dissertation as a course. Depending on the duration required for completing the project/dissertation work, credits can be assigned. Normally 26 hours of practical work/project work/dissertation work is considered to be equivalent to a credit. School can classify project as a minor or a major project depending on the credits allotted. Normally, a minor project carries 4-6 credits and a major project carries double the number of credits of a minor project.

4.2.6 SEC: It is a mandatory course to equip students with skill sets required as per the industry expectation. Candidate will seek exposure through workshops and other certificate-based courses.

4.2.7 Mandatory Course (MC): A Mandatory course should be completed successfully as a part of graduate degree program irrespective of the program of study. It doesnot have credits but that the candidates have to complete compulsorily.

4.2.8 “Program” means the academic program leading to a Degree, Post Graduate Degree, Post Graduate Diploma or such other degrees instituted and introduced in REVA University.

5. Eligibility for Admission:

5.1. The eligibility criteria for admission to **Three Years Bachelor Degree** Programs (6 Semesters) is given below:

S. No.	Program	Duration	Eligibility
1	Bachelor of Commerce (Industry Integrated)	6 Semesters (3 years)	Pass in PUC/10+2 with minimum 50% marks of any recognized Board / Council or any other qualification recognized as equivalent there to.
2	Bachelor of Commerce (Honours)		Pass in PUC/10+2 with minimum 75% marks of any recognized Board / Council or any other qualification recognized as equivalent there to.
3	Bachelor of Business Administration (Industry Integrated)	6 Semesters (3 years)	Pass in PUC/10+2 with minimum 50% marks of any recognized Board / Council or any other qualification recognized as equivalent there to.

4	Bachelor of Business Administration (Honours)	6 Semesters (3 years)	Pass in PUC/10+2 with minimum 75% marks of any recognized Board / Council or any other qualification recognized as equivalent there to.
5	Bachelor of Business Administration (Entrepreneurship)	6 Semesters (3 years)	
6	Bachelor of Arts in a) Journalism, English & Psychology (JEP) b) Political Science, Economics, Journalism (PEJ) c) Tourism, Journalism & History (TJH)	6 Semesters (3 years)	Pass in PUC /10+2 of any recognized Board / Council or any other qualification recognized as equivalent there to.
7	Bachelor of Arts in Performing Arts, English & Psychology	6 Semesters (3 years)	
8	Bachelor of Computer Applications	6 Semesters (3 years)	Pass in PUC/10+2 with at least 45% marks (40% in case of candidate belonging to SC/ST category) of any recognized Board/Council of any other qualification recognized as equivalent there to.
9	Bachelor of Science (Hons.) in Computer Science (with specialization in Cloud Computing & Big Data)	6 Semesters (3 years)	Pass in PUC/10+2 examination with Mathematics / Computer Science / Statistics as compulsory subject along with other subjects and obtained minimum 45% marks (40% in case of candidates belonging to SC/ST category) in the above subjects taken together from any Board recognized by the respective State Government /Central Government/Union Territories or any other qualification recognized as equivalent thereto.
10	B Sc in a) Mathematics, Statistics and Computer Science (MStCs)	6 Semesters (3 years)	Pass in PUC/10+2 with Mathematics as compulsory subjects and at least 45% marks (40% in case of candidate belonging to SC/ST category) of any recognized Board/Council or

	b) Physics, Mathematics and Computer Science (PMCs)		any other qualification recognized as equivalent there to.
11	B Sc in a) Bioinformatics, Statistics & Computer Science (BCsSt) b) Biotechnology, Biochemistry, Genetics c) Microbiology, Chemistry & Genetics	6 Semesters (3 years)	Pass in PUC/10+2 with Biology as compulsory subject and at least 45% marks (40% in case of candidate belonging to SC/ST category) of any recognized Board/Council or any other qualification recognized as equivalent there to.

5.2 Provided further that the eligibility criteria are subject to revision by the Government Statutory Bodies, University from time to time.

6. Courses of Study and Credits

6.1 Each course of study is assigned with certain credit value

6.2 Each semester is for a total duration of 20 weeks out of which 16 weeks dedicated for teaching and learning and the remaining 4 weeks for IAs and final examination, evaluation and announcement of results.

6.3 The credit hours defined as below

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 or a three hour session of T/P amounts to 2 credits over a period of one Semester of 16 weeks for teaching-learning process.

1 credit = 13 credit hours spread over 16 weeks or spread over the semester

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

For Example: The following table describes credit pattern

Table -2: Credit Pattern					
Lectures (L)	Tutorials (T)	Practice (P)	Credits (L:T:P)	Total Credits	Total Contact Hours
4	2	0	4:1:0	5	6
3	2	0	3:1:0	4	5
3	0	2	3:0:1	4	5
2	2	2	2:1:1	4	6
0	0	6	0:0:3	3	6
4	0	0	4:0:0	4	4

- a. The concerned BoS will choose the convenient Credit Pattern for every course based on size and nature of the course

7. Different Courses of Study:

Different Courses of Study are labeled as follows:

- a. Foundation Course (FC)
- b. Hard Core Course (HC)
- c. Soft Core Course (SC)
- d. Open Elective Course (OE)
- e. Skill Enhancement Course (SEC)
- f. Mandatory Course (MC)
- g. Project Work / Dissertation: School can offer project work/dissertation as a course. Depending on the duration required for completing the project/dissertation work, credits can be assigned. Normally 26 hours of practical work/project work/dissertation work is considered to be equivalent to a credit. School can classify project as a minor or a major project depending on the credits allotted. Normally, a minor project carries 4-6 credits and a major project carries double the number of credits of a minor project. These are defined under Section 4 of these regulations.

8. Credits and Credit Distribution

Registered candidates are required to earn the credits stated in the below table for the award of degree in the respective program:

Credits	Programs
120	BSc in Physics, Chemistry, Maths, BSc in Maths, Statistics, Comp Sci., BSc in Bioinformatics, Statistics and Computer Science, BSc in Biotechnology, Biochemistry, Genetics, BSc in Microbiology, Chemistry and Genetics, and BSc in Physics, Maths, Computer Science

The following courses are foundation courses and they are mandatory courses. Students registering for any of the programs mentioned in the table above are required to successfully complete the courses for the award of the degree.

1. Communicative English
 2. Languages K / H / Additional English
 3. Constitution of India and Professional Ethics
 4. Environmental Science
- 8.2. The concerned BoS shall prescribe the credits to various types of courses and shall assign title to every course including project work, practical work, field work, self-study elective

and classify the courses as **Foundation Course (FC)**, **Hard Core (HC)**, **Soft Core (SC)**, **Open Elective (OE)** and **Skill Enhance Course (SEC)**.

- 8.3. The concerned BoS shall specify the desired Program Educational Objectives, Program Outcomes, Program Specific Outcomes and Course Outcomes while preparing the curriculum of a particular program.
- 8.4. A candidate can enrol during each semester for credits as prescribed in the scheme of the program.
- 8.5. 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 prescribed number of credits for the award of the degree for three year program 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.
- 8.6 Add on Proficiency Diploma / Minor degree/ Honor Degree:**
To acquire Add on Proficiency Diploma/ Minor degree/ Honor Degree, a candidate can opt to complete a minimum of 18-20 extra credits either in the same discipline /subject or in different discipline / subject based on the eligibility criteria and in excess to prescribed number of credits for the award of 3-year degree in the registered program.

9 Assessment and Evaluation

- 9.1 The Scheme of Assessment will have two parts, namely;
- Internal Assessment (IA); and
 - Semester End Examination (SEE)
- 9.2 Assessment and Evaluation of each Course shall be for 100 marks. The Internal Assessment (IA) and Semester End Examination (SEE) of for 3 year programs shall carry 50:50 marks respectively (i.e., 50 marks internal assessment; 50 marks semester end examination).
- 9.3 The 50 marks of internal assessment shall comprise:

Internal Test	30 marks
Assignments / Seminars / Quizzes / Presentations / Case Studies etc.	20 marks

- 9.4 There shall be **two Internal Tests** conducted as per the schedule announced below. **The Students shall attend both the Tests compulsorily.**
- 1st test is conducted for 15 marks during **8th week** of the Semester;
 - 2nd test is conducted for 15 marks during **16th week** of the of the Semester;
 - Suitable number of Assignments/quizzes/presentations are set to assess the remaining 20 marks of IA at appropriate times during the semester
- 9.5 The coverage of syllabus for the said tests shall be as under:
- Question paper of the **1st test should be based on first 50% of the total syllabus;**
 - Question paper of the **2nd test should be based on second 50% of the total syllabus;**
- 9.6 The Semester End Examination for 50 marks shall be held in the 18th and 19th week of the beginning of the semester and the syllabus for the semester end examination shall be entire syllabus.
- 9.7 A test paper is set for a maximum of 30 marks to be answered as per the pre-set time duration (1 hr / 1 hr 15 minutes / 1 hr 30 minutes). Test paper must be designed with School faculty members agreed pattern and students are assessed as per the instructions provided in the question paper. Questions must be set using Bloom's verbs. The questions must be set to assess the students outcomes described in the course document.
- 9.8 The question papers for internal test shall be set by the internal teachers who have taught the course. If the course is taught by more than one teacher all the teachers together shall devise a common question paper(s). However, these question papers shall be scrutinized by School specific Question Paper Scrutiny Committee formed by the respective School Head /Director to bring in the uniformity in the question paper pattern and as well to maintain the necessary standards.
- 9.9 The evaluation of the answer scripts shall be done by the internal teachers who have taught the course and set the test paper.
- 9.10 Assignment/seminar/Project based learning/simulation-based problem solving/field work should be set in such a way, students be able to apply the concepts learnt to a real-life situation and students should be able to do some amount self-study and creative thinking. While setting assignment care should be taken such that the students will not be able to plagiarise the answer from web or any other resources. An assignment / Quiz or combination thereof can be set for a maximum of 20 marks. Course instructor at his/her

discretion can design the questions as a small group exercise or individual exercise. This should encourage collaborative learning and team learning and also self-study.

- 9.11 Internal assessment marks must be decided well before the commencement of Semester End examinations
- 9.12 Semester End Examination: The Semester End Examination is for 50 marks shall be held in the 18th and 19th week of the semester and the entire course syllabus must be covered while setting the question paper.
- 9.13 Semester End Examination paper is set for a maximum of 100 marks to be answered in 3 hours duration. Each main question be set for a maximum of 25 marks, main questions can have 3-4 sub questions. A total of 8 questions are set so that students will have a choice. Each question is set using Bloom's verbs. The questions must be set to assess the students' outcomes described in the course document. (Please note question papers have to be set to test the course outcomes)
- 9.14 There shall be three sets of question papers for the semester end examination of which one set along with scheme of examination shall be set by the external examiners and two sets along with scheme of examination shall be set by the internal examiners. All the three sets shall be scrutinized by the Board of Examiners. It shall be responsibility of the Board of Examiners particularly Chairman of the BOE to maintain the quality and standard of the question papers and as well the coverage of the entire syllabus of the course.
- 9.15 There shall be single evaluation by the internal teachers who have taught the subject. However, there shall be moderation by the external examiner. In such cases where sufficient number of external examiners are not available to serve as moderators internal senior faculty member shall be appointed as moderators.
- 9.16 Board of Examiners, question paper setters and any member of the staff connected with the examination are required to maintain integrity of the examination system and the quality of the question papers.
- 9.17 There shall also be a **Program Assessment Committee (PAC)** comprising at-least 3 faculty members having subject expertise who shall after completion of examination process and declaration of results review the results sheets, assess the performance level of the students, measure the attainment of course outcomes, program outcomes and assess whether the program educational objectives are achieved and report to the Director of the

School. **Program Assessment Committee (PAC)** shall also review the question papers of both Internal Tests as well Semester End Examinations and submit reports to the Director of the respective School about the scope of the curriculum covered and quality of the questions.

- 9.18 The report provided by the **Program Assessment Committee (PAC)** shall be the input to the Board of Studies to review and revise the scheme of instruction and curriculum of respective program

- 9.19 During unforeseen situation like the Covid-19, the tests and examination schedules, pattern of question papers and weightage distribution may be designed as per the convenience and suggestions of the board of examiners in consultation with COE and VC
- 9.20 University may decide to use available modern technologies for writing the tests and SEE by the students instead of traditional pen and paper
- 9.21 Any deviations required to the above guidelines can be made with the written consent of the Vice Chancellor
- 9.22 Online courses may be offered as per BACHELOR norms.
For online course assessment guidelines would be as follows:

1. If the assessment is done by the course provider, then the school can accept the marks awarded by the course provider and assign the grade as per REVA University norms.
2. If the assessment is not done by the course provider, then the assessment is organized by the concerned school and the procedure explained in the regulation will apply
3. In case a student fails in an online course, s/he may be allowed to repeat the course and earn the required credits

IAs for online courses could be avoided and will remain at the discretion of the school.

- 9.23 The online platforms identified could be SWAYAM, NPTEL, Coursera, Edx.org, Udemy, Udacity and any other internationally recognized platforms like MIT online, Harvard online etc.
- 9.24 Utilization of one or two credit online courses would be:
- 4-week online course – 1 credit – 15 hours
8-week online course / MOOC – 2 credits – 30 hours
12-week online course / MOOC – 3 credits – 45 hours
- 9.25 **Summary of Internal Assessment, Semester End Examination and Evaluation** Schedule is provided in the table given below.

Summary of Internal Assessment and Evaluation Schedule

S	Type of Assessment	when	Syllabus Covered	Ma	Reduced to	Date By which the process must be completed
1	Test-1	During 8 th week	First 50%	30	15	8 th week

2	Assignment / quiz / presentation / any other assessment method as decided by the School	On or before 8 th week (10 marks)				
3	Test -2	During 16 th Week	Second 50%	30	15	16 th Week
4	Assignment / quiz / presentation / any other assessment method as decided by the School	On or before 16 th Week (10 marks)				
5	SEE	19/20 th Week	100%	100	50	20 th Week

- Note:** 1. Examination and Evaluation shall take place concurrently and Final Grades shall be announced as per the notification from COE.
2. Practical examination wherever applicable shall be conducted after 2nd test and before second test for theory courses); the performance assessments of the mid-term test include performance in the conduction of semester end examination. The calendar of practical examination shall be decided by the respective School Boards and communicated well in advance to the Controller of Examination who will notify the same immediately

10 Assessment of Students Performance in Practical Courses

The performance in the practice tasks / experiments shall be assessed on the basis of:

- Knowledge of relevant processes;
- Skills and operations involved;
- Results / products including calculation and reporting.

- 10.1 The 50 marks meant for Internal Assessment (IA) of the performance in carrying out Practical shall further be allocated as under:

i	Conduction of regular practical / experiments throughout the semester	20 marks
ii	Maintenance of lab records	10 marks

iii	Performance of mid-term test (to be conducted while conducting experiment and write up about the experiment.	20 marks
	Total	50 marks

10.2 The 50 marks meant for Semester End Examination (SEE), shall be allocated as under:

i	Conducting 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

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

10.3 For MOOC and other Online Courses assessment shall be decided by the BOS of the School.

11. Evaluation of Minor Project / Major Project / Dissertation:

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:

Component – I	Periodic Progress and Progress Reports (25%)
Component – II	Demonstration and Presentation of work (25%)
Component – III	Evaluation of Report (50%)

All assessments must be done by the respective Schools as per the guidelines issued by the Controller of Examinations. However, the responsibility of announcing final examination results and issuing official transcripts to the students lies with the office of the Controller of Examinations.

12. Requirements to Pass a Course:

A candidate's performance from IA and SEE will be in terms of scores, and the sum of IA and SEE scores will be for a maximum of 100 marks (IA = 50, SEE = 50) and have to secure a minimum of 40% to declare pass in the course. However, a candidate has to secure a minimum of 25% (13 marks) in Semester End Examination (SEE) which is compulsory.

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

80-89	9	$v*9$	A+
70-79	8	$v*8$	A
60-69	7	$v*7$	B+
55-59	6	$v*6$	B
50-54	5.5	$v*5.5$	C+
40-49	5	$v*5$	C
0-39	0	$v*0$	F
ABSENT			AB

O - Outstanding; A+-Excellent; A-Very Good; B+-Good; B-Above Average; C+-Average; C-Satisfactory; F – Unsatisfactory.

Here, P is the percentage of marks ($P=[IA + SEE]$) 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.

a. Computation of SGPA and CGPA

The Following examples describe computation of 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 : $SGPA (Si) = \sum(Ci \times Gi) / \sum Ci$ where Ci is the number of credits of the i th course and Gi is the grade point scored by the student in the i th course.

Examples on how SGPA and CGPA are computed

Example No. 1

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course 1	3	A+	9	$3 \times 9 = 27$
Course 2	3	A	8	$3 \times 8 = 24$
Course 3	3	B+	7	$3 \times 7 = 21$
Course 4	4	O	10	$4 \times 10 = 40$
Course 5	1	C	5	$1 \times 5 = 5$
Course 6	2	B	6	$2 \times 6 = 12$
	16			129

Thus, $SGPA = 129 \div 16 = 8.06$

Example No. 2

Course	Credit	Grade letter	Grade Point	Credit Point (Credit x Grade point)
Course 1	4	A	8	$4 \times 8 = 32$
Course 2	4	B+	7	$4 \times 7 = 28$

Course 3	3	A+	9	3X9=27
Course 4	3	B+	7	3X7=21
Course 5	3	B	6	3X6=18
Course 6	3	C	5	3X5=15
	20			141

Thus, **SGPA = 141 ÷ 20 = 7.05**

b. Cumulative Grade Point Average (CGPA):

Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of the required number of credits for the respective programs are calculated taking into account all the courses undergone by a student over all the semesters of a program, i. e. :

$$\text{CGPA} = \sum(\text{Ci} \times \text{Si}) / \sum \text{Ci}$$

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

Example:

CGPA after Final Semester

Semester (ith)	No. of Credits (Ci)	SGPA (Si)	Credits x SGPA (Ci X Si)
1	20	6.83	20 x 6.83 = 136.6
2	19	7.29	19 x 7.29 = 138.51
3	21	8.11	21 x 8.11 = 170.31
4	20	7.40	20 x 7.40 = 148.00
5	22	8.29	22 x 8.29 = 182.38
6	18	8.58	18 x 8.58 = 154.44
Cumulative	120		930.24

Thus, **CGPA = 930.24/120 = 7.75**

c. Conversion of grades into percentage:

Conversion formula for the conversion of CGPA into Percentage is:

Percentage of marks scored = CGPA Earned x 10

Example: CGPA Earned 7.75 x 10=77.5

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

13. 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	Letter	Performance	FGP
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	(Numerical Index)	Grade		
	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	C	Satisfactory	Pass
< 4 CGPA	0	F	Unsatisfactory	Unsuccessful

Overall percentage=10*CGPA

- a. **Provisional Grade Card:** The tentative / provisional grade card will be issued by the Controller of Examinations at the end of every semester indicating the courses completed successfully. The provisional grade card provides **Semester Grade Point Average (SGPA)**.
- b. **Final Grade Card:** Upon successful completion of three-year Degree a Final Grade card consisting of grades of all courses successfully completed by the candidate will be issued by the Controller of Examinations.

14. Attendance Requirement:

- 14.1 All students must attend every lecture, tutorial and practical classes.
- 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.
- 14.3 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 examination and such student shall seek re-admission

15. Re-Registration and Re-Admission:

- 15.1 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 semester end examination and S/he shall have to seek re-admission to that semester during subsequent semester / year within a stipulated period.
- 15.2 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 s/he shall seek re-

admission to such dropped semester.

16. Absence during Internal Test:

In case a student has been absent from an internal test due to the illness or other contingencies s/he may give a request along with necessary supporting documents and certification from the concerned class teacher / authorized personnel to the concerned Director of the School, for conducting a separate internal test. The Director 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 internal test for such candidate(s) well in advance before the Semester End Examination of that respective semester. Under no circumstances internal tests shall be held / assignments are accepted after Semester End Examination.

17. Provision for Appeal

If a candidate is not satisfied with the evaluation of Internal Assessment components (Internal Tests and Assignments), s/he can approach the Grievance Cell with the written submission together with all facts, the assignments, and test papers, which were evaluated. S/he can do so before the commencement of respective 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 for taking disciplinary/corrective action on an evaluator if s/he is found guilty. The decision taken by the Grievance committee is final.

18. Grievance Committee:

In case of students having any grievances regarding the conduct of examination, evaluation and announcement of results, such students can approach Grievance Committee for redressal of grievances. Grievance committees will be formed by CoE in consultation with VC.

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

- The Controller of Examinations - 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.

19. Eligibility to Appear for Semester End Examination (SEE)

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 program shall be eligible to appear for Semester End Examination

20. Provision for Supplementary Examination

In case a candidate fails to secure a minimum of 25% (13 marks) in Semester End Examination (SEE) and a minimum of 40% marks together with IA and SEE to declare pass in the course, such candidate shall seek supplementary examination of only such course(s) wherein his / her performance is declared unsuccessful. The supplementary examinations are conducted after the announcement of even semester examination results. The candidate who is unsuccessful in a given course(s) shall appear for supplementary examination of odd and even semester course(s) to seek for improvement of the performance.

21. Provision to Carry Forward the Failed Subjects / Courses:

A student who has failed in a given number of courses in odd and even semesters shall move to next semester of immediate succeeding year and final year of the study. However, s/he shall have to clear all courses of all semesters within the double duration, i.e., with six years of admission of the first semester failing which the student has to re-register to the entire program.

22. Challenge Valuation:

- a. A student who desires to apply for challenge valuation shall obtain a photo copy of the answer script(s) of semester end examination by paying the prescribed fee within 10 days after the announcement of the results. S/he 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 Controller of Examinations within 10 days after the announcement of the results. This challenge valuation is only for semester end examination.
- b. The answer scripts (in whatever form) 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.

23. 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	PO9	PO10	PSO1	PSO 2	PSO3
PE01	√	√	√	√	√	√	√	√	√	√	√	√	√
PE02	√	√	√	√	√	√	√	√	√	√	√	√	√
PE03	√	√	√	√	√	√	√	√	√	√	√	√	√
PE04	√	√	√	√	√	√	√	√	√	√	√	√	√

CO PO MAPPING OF THE COURSES

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHK101	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHH101	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHA101	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHE101	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0101	CO1	2	1	1	2		2	1	1	1	3	2	1	2
	CO2	3	2	2	1	2		1		1	2	1	1	1
	CO3	3	2	2	1			1			2	1	1	2
	CO4	3	1	2	3	1	1	2	1	2	2	2	2	3
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0101	CO1	3	3	2	1			1			1	2	2	
	CO2	3	2	2	1			1			2	2	3	
	CO3	2	3	2	2		1				2	2	3	
	CO4	3	3	2	1							2	3	

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0101	CO1	3	2	3		2	2				3	3	2	
	CO2	3									3	3		
	CO3	3	3	3			3				3	3	2	
	CO4	3	3	2			3		2		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MIS111	CO1	2	1	1	2		2	1	1		3	2	1	2
	CO2	1	2	2	1	2	1	1		1	2	1	1	1
	CO3	1	2	2	1			1		2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	1
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MIS112	CO1	2	1	1	2		2	1	1	1	3	2	1	
	CO2	1	2	2	1	2		1		2	2	1	1	1
	CO3	1	2	2	1	2	1	1		1	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	1	2	2	2	3
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21LSM101	CO1	3					3	2	2	2	1			1
	CO2	3	3	3			3	2	3		1			
	CO3	3	3	3	3	3	3	3	3		1			3
	CO4	3	3	3	3	3	3	3	3		1			3
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0102	CO1	2	1	1	2			1	1		3	2	1	2
	CO2	1	2	2	1	1	2	1		2	2	1	1	1
	CO3	1	2	2	1			1			2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	1
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0102	CO1	3	2	3		2	2				3	3	2	
	CO2	3									3	3		
	CO3	3	3	3			3				3	3	2	
	CO4	3	3	2			3		2		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0102	CO1	2	1	1	2			1	1		3	2	1	
	CO2	1	2	2	1			1			2	1	1	
	CO3	1	2	2	1			1			2	1	1	
	CO4	1	1	2	2			2	1		2	2	2	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHK201	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3

	COs													
B21AHH201	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHA201	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHE201	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0201	CO1	2	1	1	2			1	1		3	2	1	1
	CO2	1	2	2	1	2		1		1	2	1	1	1
	CO3	1	2	2	1			1		2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	1	2	2	2	2
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0201	CO1	3	3	2	3			2			1	2	2	
	CO2	3	3	3	2			1			2	2	3	
	CO3	3	2	2	2			2			1	2	3	
	CO4	3	2	1	2			2			3	3	3	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0201	CO1	3	3	3	3				3		3	3	2	
	CO2	3	3	3	3		2		2		3	3	2	2
	CO3	3	3						0		3	3	2	
	CO4	3	3			3			3		3	3	2	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GNS111	CO1	3	3	3			2	3			3	3		
	CO2	3	3	3			2	3			3	2	3	
	CO3	3	3	3			2	2			3	0	3	
	CO4	3	3	3			2	2			3	2	3	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GNS112	CO1	3	3	3			3				3	3	3	3
	CO2	3	3	3	3		3	3			3	3	3	3
	CO3	3	3	3	3		3				3	3	2	
	CO4	3	3	3	3		3	3	3		3	3	3	3
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
	CO1	1	2	1	1	1	2	3	1	1	1	1	2	1

B21ASM201	CO2	1	3	1	1	1	3	3	1	1	1	1	3	1
	CO3	2	3	2	1	3	3	3	1	1	1	2	3	2
	CO4	1	2	1	1	1	2	3	1	1	1	1	2	1
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0202	CO1	2	1	1	2			1	1		3	2	1	
	CO2	1	2	2	1			1			2	1	1	1
	CO3	1	2	2	1	1	2	1		2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	1
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0202	CO1	2	2	3	2	1		2			2	1	3	1
	CO2	3	3	3	3	1		2			3	2	2	2
	CO3	3	2	2	3			2			2	3	2	2
	CO4	2	3	2	2	1		2			3	2	2	2
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0202	CO1	3		3	3						3	3	2	3
	CO2	3	3								3	3	2	
	CO3	3				3					3	3		
	CO4	3	3			3					3	3	2	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHK301	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHH301	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHA301	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0301	CO1	2	1	1	2			1	1		3	2	1	
	CO2	1	2	2	1	2	2	1		1	2	1	1	1
	CO3	1	2	2	1	2	3	1		2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	1	2	2	2	1
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0301	CO1	1	2	1	1	1	1	1			1	2	2	
	CO2	2	2	1	1	1	1	1			1	2	2	

	CO3	1	2	1	2	2	2	2			1	1	1	
	CO4	2	1	1	2	1	2	2			1	1	2	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0301	CO1	3	3				3		3		3	3	2	
	CO2	3	3	3	3	3	3		3		3	3	3	
	CO3	3	3	3		3	3				3	3	2	
	CO4	3	3	3	3		3		3		3	3	2	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CHS311	CO1	1	1	1	2						1	1	1	
	CO2	1	1	2	3						1	1	1	
	CO3	1	1	1	2						2	1	3	
	CO4	1	1	2	2						2	1	2	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CHS312	CO1	2	1	1								1	1	
	CO2	2	1	1	1	1						1	1	
	CO3	2	1	1	1	1						1	1	
	CO4	2	1	1	1	1					1	1	1	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21ASO302	CO1	2	3	3	2	2	2	2	3	1	3	2	3	1
	CO2	2	3	3	2	2	1	2	1	1	3	2	2	3
	CO3	2	3	3	2	1	1	2	1	1	3	2	2	2
	CO4	2	3	3	2	1	1	2	1	1	3	2	3	3
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0302	CO1	2	1	1	2			1	1		3	2	1	1
	CO2	1	2	2	1	2	2	1	1	1	2	1	1	1
	CO3	1	2	2	1	2		1	2	2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	2
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0302	CO1	1	2	1	1	1	1	1			1	2	1	1
	CO2	2	2	1	1	1	2	1			2	2	2	2
	CO3	1	2	1	2	2	2	1			1	1	1	1
	CO4	2	1	2	2	1	2	2			2	1	2	2
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0302	CO1	3	3	3	3			3	3	3	3	2	3	3
	CO2	3	3	3				3		3	3	2	3	3
	CO3	3	2	3	3			3		3	3	3	3	3
	CO4	3	3	3	3		3	3	3	3	3	3	3	3
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHK401	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			

	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHH401	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHA401	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0401	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0401	CO1	1	2	1	1	1	1	1			1	2	1	
	CO2	2	2	1	1	1	2	1			1	2	2	
	CO3	1	2	1	2	1	2	1			1	1	1	
	CO4	2	1	1	2	1	1	2			1	1	2	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0401	CO1	3	3	3		3	2	2			3	3	2	
	CO2	3	3				2				3	3		
	CO3	3	3	3	3	3	2				3	3	2	
	CO4	3	3	3			3	3	2		3	3	2	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MIS411	CO1	2	1	1	2			1	1		3	2	1	1
	CO2	1	2	2	1	1	1	1		2	2	1	1	1
	CO3	1	2	2	1	1	1	1		1	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	2
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MIS412	CO1	2	1	1	2	1	1	1	1	1	3	2	1	1
	CO2	1	2	2	1		2	1	2	2	2	1	1	1
	CO3	1	2	2	1	1	1	1		2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	1
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0402	CO1	2	1	1	2			1	1		3	2	1	1
	CO2	1	2	2	1	2	1	1		2	2	1	1	1
	CO3	1	2	2	1	1	2	1		3	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	1

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0402	CO1	1	2	1	1	1	1	1			1	2	1	2
	CO2	2	2	1	1	1	2	1			1	2	2	
	CO3	1	2	1	2	1	2	1			1	1	1	1
	CO4	2	1	1	2	1	1	2			1	1	2	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0402	CO1	3	3			3	2				3	3	2	
	CO2	3	3			3					3	2	2	
	CO3	3	3			3					3	3		
	CO4	3	3	3	3	3	3	3	3	3	3	3	3	3
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0501	CO1	2	1	1	2		1	1	1	2	3	2	1	2
	CO2	1	2	2	1	1	1	1		2	2	1	1	1
	CO3	1	2	2	1	2	2	1		1	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	3	2	2	2	2
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0501	CO1	2	1	1	1			1			2	1	2	
	CO2	3	2	2	1			1			2	2	2	
	CO3	2	1	1									2	
	CO4	2	1	1	1			1			1	2	2	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0501	CO1	3	3	3				3	3		3	3		2
	CO2	3	3	3	3		3	3	3		3	3		2
	CO3	3	3	3			2	2	2		3	3		2
	CO4	3	3	3	3	3	3	3	2	2	3	3		2
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GNS511	CO1	3	3	3			3		3		3	3	2	
	CO2	3	3	3			3		3		3	3	3	2
	CO3	3	3	3	3		2				3	3	3	3
	CO4	3	3	3	3		3		3		3	3	3	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GNS512	CO1	3		3					3		3	3	3	
	CO2	3	3	3	3	2	2				3	3	3	
	CO3	3	3	3	3	3	3		3		3	3	3	
	CO4	3	3	3	3	3	3				3	3	3	
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0502	CO1	2	1	1	2	1		1	1	1	3	2	1	1
	CO2	1	2	2	1	1	1	1		2	2	1	1	1
	CO3	1	2	2	1		2	1		1	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	2
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3

B21CH0502	CO1	1	2	2	1			2				3	1	2
	CO2	1	2	1	3			3				3	1	1
	CO3	1	2	2	2			2				3	1	1
	CO4	1	1	2	1			2			2	3	1	2
Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0502	CO1	3	3	3			3				3	3	3	3
	CO2	3	3	3	3		3	3			3	3	3	
	CO3	3	3	3	3		3				3	3	2	3
	CO4	3	3	3	3		3	3	3		3	3	3	3
Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0601	CO1	2	1	1	2	3	1	1	1		3	2	1	1
	CO2	1	2	2	1	2	2	1		1	2	1	1	1
	CO3	1	2	2	1	1	1	1		2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	1	2	2	2	3
Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0601	CO1	2	2	2	1		1				1	0	1	
	CO2	3	2	1	1						2	1	1	
	CO3	2	1	2	2		1				2	2	1	
	CO4	2	3	1	2		1	1			2	1	1	
Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0601	CO1	3	3	3		3	2	2			3	3	2	
	CO2	3	3	2							3	3	2	
	CO3	3	3	3		3	2				3	3	2	
	CO4	3	3	3	3	3	2				3	3	2	
Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CHS611	CO1	3	2	2	1		2				1	2	3	2
	CO2	3	2	2	2		1	1				2	3	3
	CO3	2	3	2	1						2	2	3	2
	CO4	2	3	2	2			1			1	3	3	2
Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CHS612	CO1	1		1	1						1	3	1	3
	CO2	1	2	2	1							1	1	2
	CO3	1		2	1						3	2	1	2
	CO4	1		1	2						2	3	3	1
Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0602	CO1	2	1	1	2	1	2	1	1	2	3	2	1	2
	CO2	1	2	2	1	2	1	1		2	2	1	1	1
	CO3	1	2	2	1	1	1	1		3	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	1	2	2	2	1
Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
	CO1	3	3	3	3			2			2	3	2	3
	CO2	3	3	2	3			2			2	3	1	2

B21CH0602	CO3	3	3	2	3			2			2	3	2	2
	CO4	2	2	3	3			2			2	3	3	3
Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0602	CO1	3	3		3	3	2	3		3	3	3	2	
	CO2	3	3	3	3		3	3	2	3	3	3	2	
	CO3	3	3	3	3		3	3		3	3	2		
	CO4	3	3	3		3	3	3		2	3	3	2	

B. Sc – M C G
(Microbiology, Chemistry, Genetics)
Scheme of Instruction and Detailed Syllabus
(Effective from the Academic Year 2021-22)

Scheme of Instruction

Duration: 6 Semesters (3 Years)

Sem	Course code	Title of the Course	HC/S C/ SE/C C	Credit Pattern				Ho urs
				L	T	P	Total	
First	B21AHK101	Language – II: Kannada - I	CC	1	1	0	2	3
	B21AHH101	Language – II: Hindi - I						
	B21AHA101	Language – II: Additional English - I						
	B21AHE101	Communicative English – I	CC	1	1	0	2	3
	B21MI0101	Microbiological Methods	HC	2	1	0	3	4
	B21CH0101	Chemistry-I	HC	2	1	0	3	4
	B21GN0101	Classical Genetics	HC	2	1	0	3	4
	B21MIS111	Food Microbiology	SC	2	1	0	3	4
	B21MIS112	Extremophiles						
	B21LSM101	Constitution of India and Professional Ethics	FC	0	0	0	0	2
	B21MI0102	Microbiological Methods Lab	HC	0	0	1.5	1.5	3
	B21CH0102	Chemistry-I Lab	HC	0	0	1.5	1.5	3
	B21GN0102	Classical Genetics Lab	HC	0	0	1.5	1.5	3
	Total Credits			10	6	4.5	20.5	33
Second	B21AHK201	Language – II: Kannada - II	CC	1	1	0	2	3
	B21AHH201	Language – II: Hindi - II						
	B21AHA201	Language – II: Additional English - II						
	B21AHE201	Communicative English – II	CC	1	1	0	2	3
	B21MI0201	Bacteriology and Virology	HC	2	1	0	3	4
	B21CH0201	Chemistry-II	HC	2	1	0	3	4
	B21GN0201	Cytogenetics	HC	2	1	0	3	4
	B21GNS211	Analytical techniques in Genetics	SC	2	1	0	3	4
	B21GNS212	Forensic Biology						
	B21ASM201	Environmental Science	FC	0	0	0	0	2
	B21MI0202	Bacteriology and Virology Lab	HC	0	0	1.5	1.5	3
	B21CH0202	Chemistry-II Lab	HC	0	0	1.5	1.5	3
	B21GN0202	Cytogenetics Lab	HC	0	0	1.5	1.5	3
	Total Credits			10	6	4.5	20.5	33
Third	B21AHK301	Language – II: Kannada - III	CC	1	1	0	2	3
	B21AHH301	Language – II: Hindi - III						

	B21AHA301	Language – II: Additional English - II						
	B21MI0301	Chemistry-III	HC	2	1	0	3	4
	B21CH0301	Eukaryotic Microbiology	HC	2	1	0	3	4
	B21GN0301	Molecular Genetics	HC	2	1	0	3	4
	B21CHS311	Hetero Cyclic Chemistry & Chemistry of Natural Products	SC	2	1	0	3	4
	B21CHS312	Polymer Chemistry						
	B21AS0302	Open Elective – Health and Hygiene	OE	3	0	0	3	3
	B21MIM301	Skill Enhancement Program (Mandatory course)	SEC / MC	0	0	0	0	2
	B21MI0302	Chemistry-III Lab	HC	0	0	1.5	1.5	3
	B21CH0302	Eukaryotic Microbiology Lab	HC	0	0	1.5	1.5	3
	B21GN0302	Microbial Genetics Lab	HC	0	0	1.5	1.5	3
	Total Credits			12	5	4.5	21.5	33
Fourth	B21AHK401	Language – II: Kannada - IV	CC	1	1	0	2	3
	B21AHH401	Language – II: Hindi - IV						
	B21AHA401	Language – II: Additional English - IV						
	B21MI0401	Environmental Microbiology	HC	2	1	0	3	4
	B21CH0401	Chemistry-IV	HC	2	1	0	3	4
	B21GN0401	Developmental Genetics	HC	2	1	0	3	4
	B21MIS411	Aeromicrobiology & Aquatic Microbiology	SC	2	1	0	3	4
	B21MIS412	Immunity and Medical Microbiology						
	B21PTM401	Soft Skill Training (Mandatory course)	SEC	0	0	0	0	2
	B21CHM401	Skill Enhancement Program (Mandatory course)	SEC/ MC	0	0	0	0	2
	B21MI0402	Environmental Microbiology Lab	HC	0	0	1.5	1.5	3
	B21CH0402	Chemistry-IV Lab	HC	0	0	1.5	1.5	3
	B21GN0402	Developmental Genetics Lab	HC	0	0	1.5	1.5	3
	Total Credits			9	5	4.5	18.5	32
Fifth	B21MI0501	Microbial Physiology	HC	2	1	0	3	4
	B21CH0501	Chemistry-V	HC	2	1	0	3	4
	B21GN0501	Human Genetics	HC	2	1	0	3	4
	B21GNS511	Medical Genetics	SC	2	1	0	3	4
	B21GNS512	Applicative Genetics						
	B21SBON01	MOOC/SWAYAM	SEC	2	0	0	2	2

	B21GNM501	Skill Enhancement Program (Mandatory course)	SEC/ MC	0	0	0	0	2
	B21MI0502	Microbial Physiology Lab	HC	0	0	1.5	1.5	3
	B21CH0502	Chemistry-V Lab	HC	0	0	1.5	1.5	3
	B21GN0502	Human Genetics Lab	HC	0	0	1.5	1.5	3
		Total Credits		10	4	4.5	18.5	29
Sixth	B21MI0601	Agricultural Microbiology	HC	2	1	0	3	4
	B21CH0601	Chemistry-VI	HC	2	1	0	3	4
	B21GN0601	Evolutionary & Biometrical Genetics	HC	2	1	0	3	4
	B21CHS611	Chemistry of Bio Molecules	SC	2	1	0	3	4
	B21CHS612	Electro Analytical Chemistry						
	B21SE0601	Project	HC	0	0	4	4	8
	B21MI0602	Agricultural Microbiology Lab	HC	0	0	1.5	1.5	3
	B21CH0602	Chemistry-V Lab	HC	0	0	1.5	1.5	3
	B21GN0602	Evolutionary & Biometrical Genetics Lab	HC	0	0	1.5	1.5	3
		Total Credits		8	4	8.5	20.5	33
		Total Credits of all Semesters					120	174

Semester	Credit Pattern				Hours
	L	T	P	Total	
First	10	6	4.5	20.5	33
Second	10	6	4.5	20.5	33
Third	11	5	4.5	21.5	33
Fourth	11	5	4.5	18.5	32
Fifth	10	4	4.5	18.5	29
Sixth	8	4	7.5	20.5	33
Total	60	30	30	120	174

B. Sc –Microbiology, Chemistry, Genetics (MCG)
Detailed Syllabus
(Effective from Academic Year 2021-22)
FIRST SEMESTER

Course Code	Course Title	Course Type	L	T	P	C	Hrs./ Wk.
B21AHK101	Language I: Kannada - I	FC	1	1	0	2	3

Course Description:

ಭಾಷೆಯನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗೂ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪ್ರಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಸಾಹಿತ್ಯ, ಕಲೆ, ವಾಣಿಜ್ಯ, ಆಡಳಿತಾತ್ಮಕ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ಮೊದಲ ಎರಡು ಸೆಮಿಸ್ಟರ್ ಮೂರು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು; ಮೂರು ಮತ್ತು ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ ಎರಡು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು ಹೊಂದಿದೆ.

Pre-requisites:

- ಕನ್ನಡ ಭಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಅಗತ್ಯ.
- ಭಾಷೆಯನ್ನು ಓದಲು ಮತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು.
- ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು.

Course Objectives:

- ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೊದಲನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯು ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸನದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.
- ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
 - ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಮೂಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.
 - ಅವರಲ್ಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಭಾಷೆ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ.
 - ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

Course Outcomes:

- ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.
- ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
 - ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
 - ಸಾಮಾಜಿಕ ಅರಿವು ಮೂಡಿಸುತ್ತದೆ
 - ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHK101	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			

Course Content:

Unit I ಜನಪದ ಮತ್ತು ಪ್ರಾಚೀನ ಕಾವ್ಯ

7 Hrs

1. ಸತ್ಯವಂತ ಹಡೆದವು ಜನಪದ ಗೀತೆ
2. ನೆಲಕಿರಿವೆನೆಂದು ಬಗೆವರೆ ಭಲಕಿರಿವೆ ರನ್ನ
3. ಚಿತ್ರಮಪಾತ್ರೆ ರಮತೆ ನಾರಿ ಜನ್ನ

Unit II ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯ

7 Hrs

1. ಅಬ್ಬಿಯುಮೋರ್ವೆ ಕಾಲವಶದಿಂ ಮರಾಧೆಯಂ ದಾಂಟದೆ.... ನಾಗಚಂದ್ರ
2. ವಚನಗಳು ಬಸವಣ್ಣ
3. ತಿರುನೀಲಕಂಠರ ರಗಳೆ ಹರಿಹರ

Unit III ಸಣ್ಣ ಕಥೆಗಳು

6 Hrs

1. ಕಲ್ಯಾಣಿಯ ಕೋಣ ಮಾಸ್ತಿ
2. ಯಾರೂ ಅರಿಯದ ವೀರ ಕುವೆಂಪು
3. ಸಮಸ್ಯೆಯ ಮಗು ತ್ರಿವೇಣಿ

Unit IV ನಾಟಕ

6 Hrs

1. ಟೊಳ್ಳುಗಟ್ಟಿ ಟಿ.ಪಿ. ಕೈಲಾಸಂ

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು:

೧. ಮುಗಳಿ ರಂಶ್ರೀ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. ೨೦೧೪
೨. ಸಂಗ್ರಹ. ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಚಾರಿತ್ರಿಕ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರಕಾಶಕರು ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. ೨೦೦೮
೩. ಸೀಮಾಂತಿಕ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ ೧,೨,೩,೪,೫ ಮತ್ತು ೬, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. ೨೦೧೪
೪. ಸಂಗ್ರಹ. ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಕನ್ನಡ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರಕಾಶಕರು ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. ೨೦೦೭
೫. ಹಂಪ ನಾಗರಾಜಯ್ಯ, ಸಾಂಗತ್ಯ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. ೨೦೧೦
೬. ನಾರಾಯಣ ಪಿ.ವಿ, ಚಂಪೂ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. ೨೦೧೦
೭. ಕಾಳೇಗೌಡ ನಾಗವಾರ, ತ್ರಿಪದಿ, ರಗಳೆ ಮತ್ತು ಜಾನಪದ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. ೨೦೧೦
೮. ಡಾ. ಬೆನಗಲ್ ರಾಮ ರಾವ್ ಮತ್ತು ಪಾನ್ಯಂ ಸುಂದರ ಶಾಸ್ತ್ರಿ, ಪುರಾಣ ನಾಮ ಚೂಡಾಮಣಿ, ಪ್ರಕಾಶಕರು ಪ್ರಸಾರಾಂಗ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ. ೨೦೧೦
೯. ಡಾ. ಚಿದಾನಂದ ಮೂರ್ತಿ, ವಚನ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. ೨೦೧೩
೧೦. ಸಂ. ಬಸವರಾಜು ಎಲ್. ಸರ್ವಜ್ಞ ವಚನಗಳು, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. ೨೦೧೨
೧೧. ಸಂ. ಬಸವರಾಜು ಎಲ್. ಅಕ್ಕನ ವಚನಗಳು, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. ೧೯೯೭
೧೨. ಸಂ. ಮರುಳಸಿದ್ದಪ್ಪ ಕೆ, ನಾಗರಾಜ ಕೆ. ರಂ. ವಚನ ಕಮ್ಮಟ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. ೨೦೧೬
೧೩. ನರಸಿಂಹಾಚಾರ್. ಡಿ. ಎಲ್., ಪಂಪ ಭಾರತ ದೀಪಿಕೆ, ಪ್ರಕಾಶಕರು ಡಿ.ವಿ. ಕೆ ಮೂರ್ತಿ ಪ್ರಕಾಶನ, ಮೈಸೂರು. ೨೦೧೨

- साहित्यकेमाध्यमसेप्रभावीएवंकुशलसंचारकाविकासकरसकताहै।

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHH101	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			

Course content: अध्ययनविषयसूची / पाठ्यक्रम

इकाई-1 : कहानी, संस्मरण

7 hrs

1. कहानी – नशा-प्रेमचंद
2. कहानी – सुखमयजीवन-चंद्रधरशर्मागुलेरी
3. संस्मरण – शरतकेसाथबितायाकुछसमय-अमृतलालनागर

इकाई-2: कहानी, आत्मकथा

6 hrs

4. कहानी-मरनेसेपहले-भीष्मसाहनी
5. कहानी-लालहवेली-शिवानी
6. रेखाचित्र – घीसा – महादेवीवर्मा

इकाई-3: एकांकी, व्यंग्यरचना

7 hrs

7. एकांकी – आवाजकानीलाम – धर्मवीरभारती
8. व्यंग्यरचना-भेड़ेऔरभेड़ियें-हरिशंकरपरसाई

इकाई-4: अनुवाद

6 hrs

अनुवाद : अंग्रेज़ी-हिन्दी(शब्दएवंअनुच्छेद)

सूचना : प्रत्येकइकाई 25 अंककेलिएनिर्धारितहै।

d) Suggested Text Books and References

Text book/s: पाठ्यपुस्तक:

1. हिन्दीपाठ्यपुस्तक-रेवाविश्वविद्यालय

References: सन्दर्भग्रन्थ:

1. सुबोधव्यवहारिकहिन्दी – डॉ. कुलदीपगुप्त
2. अभिनवव्यवहारिकहिन्दी – डॉ. परमानन्दगुप्त
3. हिन्दीसाहित्यकाइतिहास - डॉ. नागेन्द्र
4. आधुनिकहिन्दीसाहित्यकाइतिहास - डॉ. बच्चनसिंह

5. हिन्दीसाहित्यकानवीनइतिहास - डॉ. लालसाहबसिंह
6. शुद्धहिन्दीकैसेबोलेकैसेलिखे- पृथ्वीनाथपाण्डे
7. कार्यालयअनुवादनिदेशिका
8. संक्षेपणऔरपल्लवन - के.सी.भाटिया&तुमनसिंग

Course code	Course Title	Course Type	L	T	P	C	Hrs./Wk.
B21AHA101	Language I: Additional English - I	FC	1	1	0	2	3

Course Description:

This is a 2-credit course designed to help the learner gain competency in language through the introduction of various genres of literature. The course aims to inculcate a critical view among learners while sensitizing them to the contemporary issues around. It facilitates creative learning and helps to appreciate, assimilate and research on the various dimensions of society, culture and life.

Prerequisites: The student must possess fundamentals of language skills and be aware of social issues.

Pedagogy: Direct method / ICT / Collaborative Learning / Flipped Classroom.

Course Objectives:

- To develop linguistic prowess of the students.
- To appraise different genres of literature.
- To illustrate the fundamentals of creative language.
- To enhance consistent reading habits.

Course Outcome:

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

- Demonstrate a thorough understanding of sensitive and critical social issues.
- Develop reading skills and a wide range of vocabulary.
- Critically analyze a piece of prose or poetry.
- Explain their opinion in a coherent and communicable manner.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHA101	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			

Course Contents:

Unit-I: Values & Ethics**7 hrs**

Literature: Rabindranath Tagore - Where the Mind is Without Fear

Saki – The Lumber-room

William Shakespeare – Extract from Julius Caesar (Mark Antony's Speech)

Language: Vocabulary Building

Unit-II: Natural & Supernatural**6 hrs**

Literature: John Keats – La Belle Dame Sans Merci

Charles Dickens – The Signal Man

Hans Christian Anderson - The Fir Tree

Language: Collective Nouns

Unit-III: Travel & Adventure**7 hrs**

Literature: R.L. Stevenson – Travel

H.G. Wells – The Magic Shop

Jonathan Swift – Excerpt from Gulliver's Travels Book – I

Writing Skills: Travelogue

Unit-IV: Success Stories**6 hrs**

Literature: Emily Dickinson – Success is Counted Sweetest

Dr. Martin Luther King - I Have a Dream

Helen Keller – Excerpt from The Story of My Life

Writing Skills: Brochure & Leaflet

Reference Books:

- Tagore, Rabindranath. Gitanjali. Rupa Publications, 2002.
- Wordsworth, William. The Complete Works of William Wordsworth. Andesite Press, 2017.
- Munro, Hector Hugh. The Complete Works of Saki. Rupa Publications, 2000.
- Shakespeare, William. The Complete Works of William Shakespeare. Sagwan Press, 2015.
- Chindhade, Shirish. Five Indian English Poets: Nissim Ezekiel, A.K. Ramanujan, Arun Kolatkar, Dilip Chitre, R. Parthasarathy. Atlantic Publications, 2011.
- Dickens, Charles. The Signalman and Other Horrors: The Best Victorian Ghost Stories of Charles Dickens: Volume 2. Createspace Independent Publications, 2015.
- Anderson, Hans Christian. The Fir Tree. Dreamland Publications, 2011.
- Colvin, Sidney (ed). The Works of R. L. Stevenson. (Edinburgh Edition). British Library, Historical Prints Edition, 2011.
- Bishop, Elizabeth. Poems. Farrar, Straus and Giroux, 2011.
- Swift, Jonathan. Gulliver's Travels. Penguin, 2003.
- Dickinson, Emily. The Complete Poems of Emily Dickinson. Createspace Independent Publications, 2016.
- Brooke, Rupert. The Complete Poems of Rupert Brooke. Andesite Press, 2017.

- King, Martin Luther Jr. & James M. Washington. I Have a Dream: Writings And Speeches That Changed The World. Harper Collins, 1992.
- Keller, Helen. The Story of My Life. Fingerprint Publishing, 2016.
- Green, David. Contemporary English Grammar Structures and Composition. New Delhi: MacMillan Publishers, 2010.
- Thorpe, Edgar and Showick Thorpe. Basic Vocabulary. Pearson Education India, 2012.
- Leech, Geoffrey and Jan Svartvik. A Communicative Grammar of English. Longman, 2003.
- Murphy, Raymond. Murphy's English Grammar with CD. Cambridge University Press, 2004.

Course Code	Course Title	Course Type	L	T	P	C	Hrs./Wk.
B21AHE101	Communicative English – I	FC	1	1	0	2	3

Course Description:

This 2-credit course focuses on improving the spoken and written communication of the learners. The course develops personal, inter-personal and group skills among learners. It also addresses the functional aspects of language usage while providing specific linguistic tools through professional language learning software. The widespread reach of this course makes it highly practical and applicable.

Prerequisites: The student must have knowledge of intermediate English Grammar and LSRW skills.

Course Objectives:

- To enhance functional communication skills.
- To develop functional use of language in professional contexts.
- To utilize oral presentations in multiple contexts.
- To apply effective written skills in formal communication.

Course Outcomes:

After the completion of the course, students will be able to:

- Identify pressing issues relating to society, environment and media.
- Develop a process-oriented approach to writing.
- Apply the grammatical skills developed during the course aptly.
- Demonstrate a good command over language usage and refined interpersonal skills.

Mapping of Course Outcomes with programme Outcome

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
	CO1							2	3		3			
	CO2							2	3		3			

B21AHE101	CO3							2	3		3			
	CO4							2	3		3			

Course Contents:

Unit-I: Functional English

7 Hrs

Remedial Grammar: Past Simple; Past Continuous; Irregular Verbs

Writing Skills: Paragraph Writing

Activities: Conversations; Leaving Phone Messages

Literature: Chief Seattle – The End of Leaving and Beginning of Survival

Unit-II: Interpersonal Skills

6 Hrs

Remedial Grammar: Present Simple & Present Continuous; Activity & State Verbs

Writing Skills: Official Letters

Activities: Making Apologies; Invitations & Making Arrangements

Literature: Ruskin Bond – Tiger in the Tunnel

Unit-III: Multitasking Skills

7 Hrs

Remedial Grammar: Present Perfect; For, Since & How Long; -ed & -ing adjectives; Prefix & Opposites of Adjectives

Writing Skills: Note Making

Activities: Agreeing & Disagreeing with Opinions

Literature: Jesse Owens - My Greatest Olympic Prize

Unit-IV: Communication Skills

6 Hrs

Remedial Grammar: Collocations; Prepositions

Writing Skills: Precise Writing

Activities: Offers, Suggestions & Requests

Literature: Avijit Pathak – Onscreen Magic

Reference Books:

1. Green, David. *Contemporary English Grammar Structures and Composition*. New Delhi: MacMillan Publishers, 2010.
2. Thorpe, Edgar and Showick Thorpe. *Basic Vocabulary*. Pearson Education India, 2012.
3. Leech, Geoffrey and Jan Svartvik. *A Communicative Grammar of English*. Longman, 2003.
4. Murphy, Raymond. *Murphy's English Grammar with CD*. Cambridge University Press, 2004.
5. Rizvi, M. Ashraf. *Effective Technical Communication*. New Delhi: Tata McGraw-Hill, 2005.
6. Riordan, Daniel. *Technical Communication*. New Delhi: Cengage Publications, 2011.
7. Sen et al. *Communication and Language Skills*. Cambridge University Press, 2015.

CourseCode	Microbiological Methods	Course Type	L	T	P	C	CH
B21MI0101		HC	2	1	0	3	4

Prerequisites/Pre reading for the course:

Students should have the knowledge of the microorganisms and able to distinguish between the prokaryotic and eukaryotic cells.

Course Objectives:

The objective of this Course is to:

1. Students will learn basic concepts and techniques of microbiology
2. Provide the students to understand the scope of microbiology
3. Provides the students to various characterisation of microorganisms
4. Students will learn the application of microbes in various fields of science.

Course Outcomes:

By the end of the course the student will be able to:

1. Understand the historical development and biology of microorganism in detail
2. Understand various methodologies for microbial enumeration and their characterisation
3. Learn the various culturing and microscopic as well as biochemical identification of microorganisms
4. Learn the various techniques and applications of microbiology in industries

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0101	CO1	2	1	1	2		2	1	1	1	3	2	1	2
	CO2	3	2	2	1	2		1		1	2	1	1	1
	CO3	3	2	2	1			1			2	1	1	2
	CO4	3	1	2	3	1	1	2	1	2	2	2	2	3

Course Content:

Unit-I Introduction to Microbiology

12 hrs

Origin and historical development of microbiology, contribution of microbiologist- Leeuwenhoek, Robert Koch, Pasteur, Lister & Fleming, Kochs' postulates, biogenesis & abiogenesis theory, Microbiology as interdisciplinary science, importance and scope of microbiology.

Unit-II Microbial diversity

12 hrs

Kingdom of classifications-five kingdom and domain classification, classification criteria in the microbes, Bergeys' classification, Binomial nomenclature, classification systems in different

microbial classes and commission for the naming the organism. Nutritional classification of microbes and morphological classification of bacteria.

Unit-III Microbial culture and identification techniques

12 hrs

Staining techniques in microbiology-simple, differential & structural; microbial medium & Sterilisation techniques-physical (Heat, Radiation and Filtration) and chemical (Classes of chemicals) sterilization techniques. Molecular methods of identification and classification of microbes.

Unit –IV Microbial Growth

12 hrs

Nutritional basis for classification of microbes-phototrophs, autotrophs, heterotrophs, factors affecting growth, growth curve-phases & their importance, microbial isolation techniques-pour, streak & spread plating and enumeration of microbes-indirect & direct methods.

Reference

1. M J Pelzer Jr, ECS Chan, NR Krieg, Microbiology, TMH Publishing Co Ltd, 5th Edition, 2006.
2. Starrier, Ingraham and Wheeler, General Microbiology, McMillan Publisher, 5th Edition, 1998.
3. Atlas R.M. Microbiology: Fundamentals and applications 4th Edition, Singapore: Pearson Asia, 2000.
4. Prescott L.M, Harley T.P and Klein D.A. Microbiology, 9th Edition, WMC. Brown publishers, 2012.

CourseCode	Chemistry-I	Course Type	L	T	P	C	CH
B21CH0101		HC	2	1	0	3	4

Prerequisites:

Atomic models, fundamental particles of an atom, periodic table and its origin, hydrogen carbons and its classifications, states of matter.

Course objectives:

1. Provide brief descriptions of the accomplishments of Planck, Einstein, Rutherford, Rydberg, Bohr, de Broglie and Schrodinger; and how these contributed to understanding the structure of atom
2. Calculate the energy and wavelength of a given electronic transition in hydrogen atom.
3. Discuss the periodic properties of the elements, and their variations across the period and down the group.
4. Explain the preparation, properties and reactions of alkanes, alkenes and alkynes.
5. Applications of various reagents and reactions on organic synthesis.
6. Focuses on the Maxwell-Boltzmann distribution of molecular velocities.

Course Outcomes:

CO1: Formulate Rydberg equation to calculate all spectral lines of hydrogen atom.

CO2: Discuss the importance of atomic number in constructing periodic table.

CO3: Examine the role of reagents, named reactions and their applications in organic chemistry.

CO4: Utilize the concepts of different types of molecular velocities and establish the relationship between them.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0101	CO1	3	3	2	1			1			1	2	2	
	CO2	3	2	2	1			1			2	2	3	
	CO3	2	3	2	2		1				2	2	3	
	CO4	3	3	2	1							2	3	

Course Contents:**Unit-I: Atomic Structure****12 Hrs**

Fundamental particles of atoms, Bohr's theory and its limitations, Hydrogen atomic spectra, Derivation of expressions for radius and energy of hydrogen like atoms. Planck Quantization - Black body radiation, dual nature of electron, de Broglie's hypothesis.

Quantum Mechanics: Introduction, Heisenberg Uncertainty principle. wave functions, time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2 . Application of Schrodinger wave equation: particle in one dimensional box. Quantum numbers, Shapes of s, p and d orbitals. Radial and angular parts of the hydrogenic wave functions and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals. Radial and angular nodes and their significance. Electronic configuration, Aufbau principle, Pauli's exclusion principle, Hund's rule of maximum multiplicity and (n+l) rule.

Unit-II: Periodic Table and Periodicity**12 Hrs**

Introduction, Modern periodic law, Periodic classification of elements, Periodic properties and Causes:

- Atomic radius: Definitions of covalent, metallic & van der Waals' radius; calculation of atomic radius from internuclear distance.
- Ionic radius: Definition, calculation by Pauling's method, Slater's rules.
- Ionization energy and electron affinity: Definitions, methods of determination.
- Electronegativity evaluation by Pauling's and Mulliken's methods.

Comparative study of groups 1, 2, 16 and 17. Halides, oxides and carbonates of alkali and alkaline earth metals. Hydrides of chalcogens and halogens.

General study of d and f block Elements-Transition elements: electronic configuration, atomic and ionic radii, ionization energy, oxidation states, redox potentials, spectral and magnetic properties, catalytic activity, interstitial compound formation.

Unit-III Introduction to Organic Chemistry

12 Hrs

Nomenclature (IUPAC) of bifunctional, aliphatic and aromatic compounds.

Alkanes: Methods of formation (corey-house reaction etc.), physical and chemical properties. Halogenation, Nitration, Oxidation and Combustion reactions.

Alkenes: Preparation by wittig, Hoffmann's elimination. Mechanism of electrophilic addition, oxymercuration, reduction, hydroboration – oxidation and epoxidation. Chemical oxidation of alkene with KMnO_4 and OsO_4 , ozonolysis. **Dienes:** Types, relative stabilities of dienes, conjugated dienes – 1,3 butadiene-structure, 1,2 and 1,4- addition reactions with H_2 and halogens, Diels-Alder reaction with an example.

Alkynes: Methods of preparation – Dehydrohalogenation, vicinal and gem dihalides, reactions of alkynes – Electrophilic additions with HCN , CH_3COOH and H_2O .

Alkyl halides: Isomerism and classification, nomenclature. Substitution reaction- $\text{S}_{\text{N}}1$, $\text{S}_{\text{N}}2$, with mechanism. Effect of substrate and nucleophiles. Nature of leaving group.

Relative reactivity of alkyl, allyl, vinyl and aryl halides towards nucleophilic substitution reactions.

Reactive intermediates: Generation, stability of carbocations, carbanions, free radicals, nitrene, carbenes, benzyne and ylides.

Electronic effects (resonance, inductive, hyperconjugation) and steric effects and its applications (acid/base property).

Unit-IV Gaseous state

12 Hrs

Maxwell-Boltzmann distribution of molecular velocities. Effect of temperature. Mean free path, collision frequency and collision number. Definition and expressions using SI units (no derivations). Boltzmann factor. Energy distribution as a function of temperature. Types of molecular velocities and relationships between them and numerical.

The critical phenomena – Andrew's experiments on CO_2 , critical constants – T_c , P_c and V_c . Relation between Vander Waal's Constants 'a' and 'b' and critical constants T_c , P_c and V_c to be derived using isotherms of CO_2 . Law of corresponding states and reduced equation of state. Liquefaction of gases – Principle underlying liquefaction of gases – Joule Thomson effect, Joule Thomson coefficient, Inversion temperature, definitions and its relation between Van der Waal's constants ('a' and 'b').

Phase Rule: Definition of terms: Phase, components and degrees of freedom – Derivation of Gibbs phase rule. One component system: Water and Sulphur system, Reduced phase rule.

Two component system: Simple eutectic system: Pb-Ag system, KI-water system freezing mixtures. Thermal analysis and cooling curves. Compound formation with congruent melting point Zn-Mg , $\text{FeCl}_3\text{-Water}$ system.

Suggested Text Books and References:

1. A. Bahl, and B.S. Bahl, Advanced Organic Chemistry, S. Chand, 2010.
2. A. Bahl, and B.S. Bahl, Advanced Physical Chemistry, S. Chand, 2010.
3. J.N. Gurtu and A. Gurtu, Advanced Physical Chemistry, Pragati Prakashan, Vol I, 4th Edition, 2017.
4. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Vishal Publishing Co., 33rd Edition, 2020.

5. P.A. Sykes, Guide book to Mechanism in Organic Chemistry, Orient Longman, New Delhi, 1988.
6. R.T. Morrison and R.N. Boyd, Organic Chemistry, Pearson, 2010.
7. B.H. Mahan, University Chemistry, Narosa, 3rd Edition, 1998.
8. J.D. Lee, Concise Inorganic Chemistry, Oxford University Press, 3rd Edition, 2008.
9. F.A. Cotton, G. Wilkinson and P.L. Gaus, Basic Inorganic Chemistry, Wiley, 3rd ed, 1995.

Course Code	Classical Genetics	Course Type	L	T	P	C	CH
B21GN0101		HC	2	1	0	3	4

Prerequisites/Pre reading for the course:

1. Students should have the knowledge of the cell types.
2. They should have prior idea about the classification of organisms.

Course Objectives:

The objective of this Course is to:

1. To explore the world of research using model organisms.
2. To understand the inheritance pattern of Mendelism
3. To analyze the different gene interactions and inheritance
4. To discuss the involvement of chromosomes in sex determination.

Course Outcomes:

By the end of the course the student will be able to:

1. Compare the different model organisms used for research and its significance.
2. List out the milestones in the evolution of genetics.
3. Outline the inheritance patterns of traits and the interaction of genes.
4. Illustrate the involvement of chromosomes in sex determination and the mechanisms involved in sex differentiation.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GN0101	CO1	3	2	3		2	2				3	3	2	
	CO2	3									3	3	0	
	CO3	3	3	3			3				3	3	2	
	CO4	3	3	2			3		2		3			

Course Content:

UNIT I Scope of Genetics

12 hrs

Model organisms -Structure, life cycle, genetic and industrial applications)

Prokaryotes –Bacteriophage, TMV, *Escherichia coli*

Eukaryotes – *Coenorhabditis elegans*, *Drosophila melanogaster*, *Arabidopsis thaliana*, Zebrafish, Rattus species, *Saccharomyces cerevisiae*, *Pichia pastoris*

History of Genetics – Pre- Mendelian genetic concepts: Preformation, Epigenesis, Inheritance of acquired characters and Mutation theory.

UNIT II Menedelian Genetics

12 hrs

Biography of Mendel and his experiments on pea plants.

Principle of dominance.

Law of Segregation: Monohybrid cross, back cross and Test cross, Problems related.

Law of Independent Assortment: Dihybrid cross in pea plant, Back cross and Test cross.

UNIT III Multiple alleles & gene interactions

12 hrs

Multiple Alleles: Definition, ABO blood groups and Rh factor in Human,

Gene Interactions

Inter allelic: -

Complementary gene interaction (9:7) Ex: *Lathyrus odoratus*

Supplementary gene interaction (9:3:4) Ex: Grain color in Maize.

Epistasis - Dominant Ex.: Fruit color in *Cucurbita pepo*, Recessive - Ex.: Coat color in *Mice*.

Non- Epistasis - Ex.: Comb pattern in Poultry. Related problems

UNIT IV Sex Determination

12 hrs

Chromosome theory of Sex determination: XX- XY, XX-XO, ZZ-ZW, Genic Balance theory of Bridges, Intersexes and Super sexes in *Drosophila*, Y chromosome in sex determination of *Melandrium*.

Environment and sex determination; Hormonal control of Sex determination (Free martins).

Gynandromorphs. Sex differentiation. Dosage compensation.

Deviations from Mendelism: Incomplete inheritance and Co-dominance.

Related problems

Reference Books:

1. Biology: The Dynamic Science, 2nd Edition, Peter J. Russell, Paul E. Hertz. Beverly Mc Millan publications. 2012
2. Cell and Molecular Biology, 4th Edition, P.K. Gupta. 2014
3. Cytogenetics, 1st Edition, P.K. Gupta. 2013
4. Microbiology, 3rd Edition, P.D. Sharma. 2012.
5. Gardner/Simmons/Snustad. (2006). Principles of Genetics. 8th edition, John Wiley and sons.

CourseCode	Food Microbiology	Course Type	L	T	P	C	CH
B21MIS111		SC	2	1	0	3	4

Prerequisites/Pre reading for the course:

Students should have the basic knowledge microbial food products and spoilage.

Course Objectives:

The Objectives of this course is:

1. Understand the principles of microorganisms associated food and food products.
2. Recognize specific types of microbial spoilage during various food shelf-life stages.

3. Isolation, identification, and enumeration of the most common microorganisms found in specific food products.
4. Analyze different foods for presence of hazardous microorganisms using traditional and modern food microbiology technology.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MIS111	CO1	2	1	1	2		2	1	1		3	2	1	2
	CO2	1	2	2	1	2	1	1		1	2	1	1	1
	CO3	1	2	2	1			1		2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	1

Course Outcomes:

By the end of the Course students will be able to:

1. Better understand the factors and sources of food contaminants
2. Describe the situations where improper food handling and storage may lead to the spoilage or contamination of food.
3. Identify desirable microorganisms and their effects in preservation and fermentation.
4. Develop the beneficial microbes in health and other allied food industries

Course Contents:

Unit I Food microbiology and fermented foods

12 hrs

Definition, concepts and scope, Definition of fermentation, Microorganisms in food fermentation, production and importance of Single Cell Protein and probiotics, microorganisms involved in producing fermented foods such as bread, cheese and curd.

Unit II Food spoilage and preservation

12 hrs

Food as a substrate for growth of microorganisms, sources of contamination, principles of spoilage, microbial spoilage of food and food preservation techniques. Microbial spoilage of food – Fruits, vegetables, meat, poultry, canned foods. Approaches and methods of food processing and food preservation-physical, chemical and biological methods (Chemicals, Antibiotics, Bacteriocins).

Unit III Microorganisms in Foods and methods for detection

12 hrs

Fresh meat, Processed meat and poultry, Culture, Microscopic, and Sampling Method for detecting microbes, Physical, Chemical methods, Whole animal assays, Immunological methods. Mycotoxins, Aflatoxins Alternaria Toxins, Toxigenic Phytoplankton's and viruses.

Unit IV Applications of Food Microbiology

12 hrs

Beneficial uses of microorganisms in Food Intestinal Beneficial Bacteria-Concept of Prebiotics and Probiotics, genetically modified foods. Biosensors in foods. Various applications in dairy and food industries.

Reference

1. Food Microbiology, 2nd Edition By Adams
2. Modern Microbiology, James M. Jay
1. Fundamental Food Microbiology, Bibek Ray. CRC press
2. Norman G. M. and Robert B. G. 2006. Principles of Food Sanitation. Springer Science, Business Media. Inc.

Course Code	Extremophiles	Course Type	L	T	P	C	CH
B21MIS112		SC	2	1	0	3	4

Prerequisites/Pre reading for the course:

Students should have basis of microorganisms and their various adaptations to the various environments.

Course Objectives:

The Objectives of this course is:

1. Facilitate the students to understand microbes in extreme environments.
2. Impart the knowledge of thermophilic microbes and their importance.
3. Utilization of halophilic microbes and their applications.
4. Inculcate the knowledge to produce products from using extremophiles.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MIS112	CO1	2	1	1	2		2	1	1	1	3	2	1	
	CO2	1	2	2	1	2		1		2	2	1	1	1
	CO3	1	2	2	1	2	1	1		1	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	1	2	2	2	3

Course Outcomes:

By the end of the course the student will be able to

1. Acquire the knowledge of role of various microorganisms in extreme environment.
2. Identify the different of thermophiles and their molecular identification.
3. Inculcate the various halophiles and its applications
4. Impart the knowledge of energy production from microorganisms using extremophiles.

Course Contents:

Unit-I Microbes in extreme environmental conditions**12 hrs**

Microbial Diversity in extreme environment. Peculiar features of Archaea compared to bacteria. Identification of microbes in extreme environment.

Unit-II Thermophilic microbes**12 hrs**

Thermophiles-classes, extremely thermophilic archaeobacteria, thermozymes, psychrophilespsychrophilic archaeal extremozymes, Molecular adaptation of extremophiles. Protein stability in extremophilic microbes.

Unit-III Halophilic Microbes**12 hrs**

Halophiles-osmoregulation, cellular adaptation, structural adaptation, molecular adaptation & Xerophiles. Radiation resistant bacteria-Deinococcus radiodurans.

Unit-IV Biotechnological applications of archaea.**12 hrs**

Bioelectronics from lipids of archaea. Space microbiology-introduction. Panspermia-definition, mechanisms proposed. Microbiological research in space environment.

Reference

1. Johri, B.N(2000)Extremophiles .Springer Verlag , New York
2. Colwd , D.(1999) Microbial Diversity. Academic Press.
3. Kushner,D.J(2007)Microbial Life in Extreme Environments,.Academic Press.
4. Edward,C(1990) Microbiology of Extreme Environments. Open University Press.
5. Da Costa,M.S., Duarte,J.C & Williams,R.A.D(1989) Microbiology of Extreme Environments and its potential for Biotechnology. Elsevier Applied Science, London.
6. Heinrich,M.R (1976)Extreme Environment: Mechanism of Microbial Adaptation. Academic Press.
7. Thomas, D(1988) Thermophiles: General, Molecular and Applied Microbiology.WileyInterscience Publication.
8. Perry,J.J.,Staley,J(1997)Microbiology: Dynamics and Diversity .Saunders College Publishers.

Course Code	Indian Constitution & Professional Ethics	Course Type	L	T	P	C	CH
B21LSM101		FC	2	0	0	2	2

Course Objectives:

1. To provide and gain knowledge on Constitution of India.
2. To know and understand about the Fundamental Rights, Duties and other Rights which is been given by our law.
3. To prepare students in the understanding of Constitution perspective and make them face the world as a bonafide citizen.
4. To attain knowledge about ethics and also know about professional ethics.
5. Explore ethical standards followed by different companies.

Course Outcomes:

After completion of this course the students will be able to:

1. Strengthen the knowledge on Indian constitutional law and make the practical implementation.
2. Understand the fundamental rights and human rights.
3. Get the knowledge to explain the duties and more importantly practice it in a right way.
4. Adopt the habit of raising their voice against unconstitutionality of any laws and upon any legal discrimination as we have session of debates on Constitutional validity.
Get exposed about professional ethics and know about etiquettes about it.
5. Know about ethical standards of different companies which will increase their professional ability.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS/ COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21LSM101	CO1	3					3	2	2	2	1			1
	CO2	3	3	3			3	2	3		1			
	CO3	3	3	3	3	3	3	3	3		1			3
	CO4	3	3	3	3	3	3	3	3		1			3

Course Content:**UNIT-I:****6 Hrs**

Constitution of India: Making of Indian Constitution, features of Indian Constitution Preamble to the Constitution of India, Fundamental Rights under Part III; Rights to Equality, Right to Freedom, Right against Exploitation, Rights to Freedom of Religion, Cultural and Educational Rights, Constitutional Remedies. Fundamental Duties of the Citizen, Significance and Characteristics. Elements of National Significance; National Flag, National Anthem, National Emblem.

UNIT -II: Legislature and Executive**6 Hrs**

Organs of the Government; Legislature, Executive and Judiciary. Union and State Executives: President, Vice President, Prime Minister, Cabinet, Governor, Council of Ministers, Electoral process, Election Commission.

UNIT-III: Judiciary**6 Hrs**

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

Unit-IV: Professional Ethics**6 Hrs**

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

Text Books:

1. M V Pylee, An introduction to Constitution of India
2. M Govindarajan, S Natarajan, V S Senthil Kumar, Engineering Ethics.
3. Dr. Durga Das Basu, Introduction to constitution of India

Course Code	Microbiological Methods Lab	Course Type	L	T	P	C	CH
B21MI0102		HC	0	0	1.5	1.5	3

Prerequisites/Pre reading for the course:

Requires theoretical knowledge of microbial culture medias and staining of bacteria for microscopy.

Course Objectives:

The objective of this course is to

1. Explore the various culturing aspects of microorganisms.
2. Familiarise students with various staining procedures associated with microorganisms.
3. Expose the students with different methods of isolation and enumeration of microorganisms.
4. Provide various applications of microorganism in allied fields.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0102	CO1	2	1	1	2			1	1		3	2	1	2
	CO2	1	2	2	1	1	2	1		2	2	1	1	1
	CO3	1	2	2	1			1			2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	1

Course Outcomes:

After completing the course, the student shall be able to:

1. Determine the various cultural aspects involved in microbiology.
2. Characterise the microorganism by the microscopic and biochemical procedures.
3. Derive the mathematical and graphical analysis of microbial growth.
4. Enumerate the microbial dynamics of various samples.

Course Contents:

1. Microbiological media preparation-NA, NB & MRBA
2. Sterilisation of medium and aseptic techniques
3. Isolation of MOs from air and soil
4. Pure culture methods-pour, spread & streak plate methods

5. Staining methods-simple, Gram, endospore and negative staining
6. Microbial growth curve-turbidimetric studies
7. Haemocytometer
8. MPN test

Reference

1. Microbiology Laboratory Manual: Cappuccino and Sherman
2. Prescott L.M, Harley T.P and Klein D.A. Microbiology, 9th Edition, WMC. Brown publishers, 2012

CourseCode	Chemistry Practical-I	Course Type	L	T	P	C	CH
B21CH0102		HC	0	0	1.5	1.5	3

Prerequisites:

Knowledge of chemicals, glasswares and instruments, systematic way of recording readings, basics of mathematics.

Course Objectives:

1. Provide basic knowledge of handling hazardous chemicals and safety precautions while performing experiments.
2. Hands on training about conduction of experiments independently.
3. Prepare the required solutions, using molarity and normality equations.
4. Apply suitable formule to obtain results, based on the results draw conclusions.

Course Outcomes:

CO1: Acquire the skill of handling glasswares, chemicals and instuments used in the laboratory.

CO2: Prepare the standard solutions and use the same for the estimation of requied from the given solution.

CO3: Build analytical skills such as recording the reading, interpretation of the date and drawing conclusions.

CO4: Estimate the amount of chlorine present in bleaching powder and COD in waste water.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21CH0102	CO1	3	2	3		2	2					3	2	3
	CO2	3										3		2
	CO3	3	3	3			3					3	2	
	CO4	3	3	2			3				2			

Course Contents:

1. Calibration of: (i) Pipette (ii) Burette (iii) Volumetric flask

2. Estimation of Carbonate and Bicarbonate in a given mixture using standard hydrochloric acid.
3. Estimation of potassium permanganate by using standard solution of oxalic acid present in the solution.
4. Determination of the percentage of available chlorine in the given sample of bleaching powder.
5. Estimation of ferrous and ferric iron in a given mixture using standard potassium dichromate solution
6. Estimation of COD of given waste water sample.
7. Estimation of total hardness of water.
8. Estimation of ammonium chloride using standard sodium hydroxide and standard hydrochloric acid solutions (back titration).
9. Determination of the density using specific gravity bottle and viscosity of a liquid using Ostwald's viscometer.
10. Determination of the density using specific gravity bottle and surface tension of a liquid using stalagmometer.
11. Effect surfactants on the surface Tension of water (Stock solution)

Suggested Text Books and References:

1. B.D. Khosla, V. C. Garg, A. Gulati, Senior Practical Physical Chemistry, R. Chand & Co., New Delhi, 2011.
2. S.W. Rajbhoj and T. K. Chondhekar, Systematic Experimental Physical Chemistry, Anjali Publication, 2nd Edition, 2000.
3. Sunita Rattan, Experiments in Applied Chemistry, S.K. Kataria & Sons, 2nd edition 2008.
4. B.D. Khosla, V.C. Garg and A. Gulati, Senior Practical Physical Chemistry, R. Chand & Co., New Delhi, 2011.
5. C.W. Garland, J.W. Nibler and D. P. Shoemaker, Experiments in Physical Chemistry, 1997.

Course Code	Classical Genetics Lab	Course Type	L	T	P	C	CH
B21GN0102		HC	0	0	1.5	1.5	3

Prerequisites/Pre reading for the course:

Requires theoretical knowledge of chemicals and biotechniques.

Course Objectives:

The objective of this Course is to

1. Apply basic techniques in the organic laboratory for preparation, purification and Identification of organic compounds.
2. To develop the skills among students to understand the theory and practice of bio analytical techniques
3. To provide among students the scientific understanding of analytical techniques and detail

interpretation of results.

Course Outcomes:

After completing the course, the student shall be able to:

1. Elucidate structures of unknown compounds using qualitative organic analysis.
2. Identify the amino acids given in the sample.
3. Identify the carbohydrates given in the sample.
4. To determine the extent of pollution in water.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21GN0102	CO1	2	1	1	2			1	1		3	2	1	
	CO2	1	2	2	1			1			2	1	1	
	CO3	1	2	2	1			1			2	1	1	
	CO4	1	1	2	2			2	1		2	2	2	

Course Contents:

1. Study of Model organisms and their genetic significance -
Prokaryotes – Bacteriophage, TMV, *Escherichia coli*
2. Study of Model organisms and their genetic significance
Eukaryotes – *Coenorhabditis elegans*, *Saccharomyces cerevisiae*, *Drosophila melanogaster*, *Arabidopsis thaliana*, Zebrafish.
3. Gram Staining – *Lactobacillus* and *E. coli*
4. Blood grouping.
5. Genetic problems on: Multiple alleles
6. Genetic problems on Gene Interactions (Complementary/ Supplementary/ Dominant Epistasis gene interactions)
7. Study of Barr body in buccal epithelial cells.
8. Study of mitochondria using Janus green.

Reference Books:

1. Biology: The Dynamic Science, 2nd Edition, Peter J. Russell, Paul E. Hertz. Beverly Mc Millan publications. 2012
2. Cell and Molecular Biology, 4th Edition, P.K. Gupta. 2014
3. Cytogenetics, 1st Edition, P.K. Gupta. 2013
4. Microbiology, 3rd Edition, P.D. Sharma. 2012.
5. Gardner/Simmons/Snustad. (2006). Principles of Genetics. 8th edition, John Wiley and sons.

SECOND SEMESTER

Course code	Course Title	Course Type	L	T	P	C	Hrs./Wk.
B21AHK201	Language II: Kannada-II	FC	1	1	0	2	3

Course Overview:

ಭಾಷೆಯನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗೂ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪ್ರಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಸಾಹಿತ್ಯ, ಕಲೆ, ವಾಣಿಜ್ಯ, ಆಡಳಿತಾತ್ಮಕ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ಮೊದಲ ಎರಡು ಸೆಮಿಸ್ಟರ್ ಮೂರು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು; ಮೂರು ಮತ್ತು ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ ಎರಡು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು ಹೊಂದಿದೆ.

Pre-requisites:

- ಕನ್ನಡ ಭಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಅಗತ್ಯ.
- ಭಾಷೆಯನ್ನು ಓದಲು ಮತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು.
- ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು.

Pedagogy: ICT/Blended learning/Direct method/Collaborative/Flipped Classroom.

Course Objectives: ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೊದಲನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

- ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
- ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಮೂಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.
- ಅವರಲ್ಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಬರಾಣೆ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ.
- ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

Course Outcomes:

- ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನದ ವಿವಿಧ ಪ್ರಕಾರದ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.
- ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ದ್ರಾವಿಡ, ಸಾಂಸ್ಕೃತಿಕ, ಪರಿಸರ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ, ವಿಚಾರಗಳೆಡೆ ಗಮನ ಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಬಾವವು ಬೆಳೆಯುತ್ತದೆ.
- ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
- ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.
- ಸಂತೋದನಾ ಮನೋಭಾವ ಮತ್ತು ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸುತ್ತದೆ.

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3
	CO1							2	3		3			
	CO2							2	3		3			

B21AHK201	CO3							2	3		3			
	CO4							2	3		3			

Course Content:

Unit-I ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯ

7 Hrs

- | | |
|-----------------------------|------------|
| 1. ಚಂದ್ರಮತಿ ವಿಲಾಪ | ರಾಘವಾಂಕ |
| 2. ಹಗೆಗಳನು ಹಿಂಡಿದನು ಮನದೊಳಗೆ | ಕುಮಾರವ್ಯಾಸ |
| 3. ಗೋರಕ್ಷ ಪ್ರಸಂಗ | ಚಾಮರಸ |

Unit II ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯ

7 Hrs

- | | |
|-------------------------|--------------|
| 1. ತ್ರಿಪದಿಗಳು | ಸರ್ವಜ್ಞ |
| 2. ಗಿಳಿಯು ಪಂಜರದೊಳಿಲ್ಲ | ಪುರಂದರ ದಾಸರು |
| 3. ಕರೆದು ಕೊಟ್ಟನು ಶಾಪವನು | ಕನಕದಾಸರು |

Unit III ಲೇಖನಗಳು

6 Hrs

- | | |
|---------------------------------|----------------|
| 1. ಆತ್ಮಶ್ರೀಗಾಗಿ ನಿರಂಕುಶಮತಿಗಳಾಗಿ | ಕುವೆಂಪು |
| 2. ಮಾನವೀಯತೆ ಅಂತಾರಲ್ಲಾ | ದೇವನೂರು ಮಹಾದೇವ |
| 3. ಭೂತಾಯಿ ಮುನಿದಾಳು | ಮುರಾರಿ ಬಲ್ಲಾಳ |

Unit IV ಪ್ರವಾಸ ಕಥನ

6 Hrs

1. ನನ್ನೊಳಗಿನ ಹಾಡು ಕ್ಯೂಬಾ (ಸಂಗ್ರಹ) ಜಿ.ಎನ್. ಮೋಹನ್

Reference Books:

1. ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸಂಗ್ರಹ. ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಚಾರಿತ್ರಿಕ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರಕಾಶಕರು ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2008
3. ಸೀಮಾಂತಿಕ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
4. ಸಂಗ್ರಹ. ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಕನ್ನಡ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರಕಾಶಕರು ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2007
5. ನಾರಾಯಣ ಪಿ.ವಿ, ಚಂಪೂ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
6. ಕಾಳೇಗೌಡ ನಾಗವಾರ, ತ್ರಿಪದಿ, ರಗಳೆ ಮತ್ತು ಜಾನಪದ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
7. ಸಂ. ಬೆನಗಲ್ ರಾಮ ರಾವ್ ಮತ್ತು ಪಾನ್ಯಂ ಸುಂದರ ಶಾಸ್ತ್ರಿ, ಪುರಾಣ ನಾಮ ಚೂಡಾಮಣಿ, ಪ್ರಕಾಶಕರು ಪ್ರಸಾರಾಂಗ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ. 2010
8. ಡಾ. ಚಿದಾನಂದ ಮೂರ್ತಿ, ವಚನ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013
9. ಸಂ. ಮರುಳಸಿದ್ಧಪ್ಪ ಕೆ, ನಾಗರಾಜ ಕಿ.ರಂ. ವಚನ ಕಮ್ಮಟ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
10. ಮರುಳಸಿದ್ಧಪ್ಪ ಕೆ, ಷಟ್ಪದಿ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
11. ಸಂ. ಸೇತುರಾಮ ರಾವ್ ಆ.ರಾ., ಶ್ರೀ ಲಕ್ಷ್ಮೀಶನ ಜೈಮಿನಿ ಬ್ರಹ್ಮರತ(ಮೂಲ-ತಾತ್ಪರ್ಯ-ಸಚಿತ್ರ), ಪ್ರಕಾಶಕರು ಕಾಮಧೇನು ಪುಸ್ತಕ ಭವನ, ಬೆಂಗಳೂರು. 2010

Course Code	Course Title	Course Type	L	T	P	C	Hr/Wk
B21AHH201	Language – II: Hindi - II	FC	1	1	0	2	3

Course description: अध्ययनवर्णन :

यह पाठ्यक्रम नौ सिखिया,
अपनी भाषा की क्षमता का विकास करने हेतु तथा विभिन्न साहित्यिक प्रक्रियाओं द्वारा समाज,
संस्कृति एवं जीवन के मूल्यों को समझने हेतु अभिकल्पित है।

Prerequisites/Pre reading for the course:

- अध्येता, पी.यु.सी के स्तर पर द्वितीय भाषा के रूप में हिन्दी का अध्ययन करना चाहिए।
- हिन्दी साहित्य के इतिहास का संक्षिप्त ज्ञान की आवश्यकता है।
- हिन्दी व्याकरण का अवबोधन आवश्यक है।
- हिन्दी-अंग्रेजी अनुवाद से संबंधित जानकारी जरूरी है।

c) Pedagogy: शिक्षाशास्त्र :

- Direct method
- ICT and Digital support
- Collaborative and Cooperative learning
- Differentiated Instruction
- Flipped Classroom

Objectives: पाठ्यक्रम उद्देश्य:

- संदर्भानुसार उचित भाषा का प्रयोग करने की दक्षता को छात्रों में उत्पन्न करना।
- साहित्य के माध्यम से समाज एवं मानवीय मूल्यों को समझाकर, उन मूल्यों की रक्षा हेतु प्रेरित करना।
- छात्रों में पुस्तक पठन एवं लेखन की अकृतिम प्रवृत्ति स्थापित करना।
- अध्येताओं में साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास करना।

Learning Outcomes: अधिगम परिणाम:

अध्ययन की समाप्ति पर अध्येता –

- सामाजिक मूल्य एवं नैतिक जवाबदेही को स्वीकार कर सकता है।
- साहित्य की प्रासंगिकता को जीवन में समझने की दक्षता रखता है।
- समाज में अंतर्निहित पद्धतियाँ एवं विचारधाराओं का व्याख्यान करने में सक्षम बन सकता है।
- साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास कर सकता है।

Mapping of Course Outcomes with Program Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3
B21AHH201	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			

	CO4						2	3		3			
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Course Content: अध्ययनविषयसूची / पाठ्यक्रम

इकाई – 1 कविता: प्राचीन एवं आधुनिक

7 hrs

1. कबीरके दोहे
2. कविता – जलियाँवाला बाग में बसंत- सुभद्रा कुमारी चौहान
3. कविता – सुभाषकी मृत्यु पर - धर्मवीर भारती

इकाई – 2 कविता: प्राचीन एवं आधुनिक

6 hrs

4. तुलसीदासके पद
5. कविता – पाषाणी – नागार्जुन
6. कविता – चलना हमारा काम है- शिवमंगलसिंह सुमन

इकाई – 3 कविता: प्राचीन एवं आधुनिक

7 hrs

7. मीराबाईके पद
8. कविता – मेरे सपने बहुत नहीं हैं- गिरिराज कुमार माथुर
9. कविता – अभीनहोगा मेरा अंत – निराला

इकाई – 4

6 hrs

अनुवाद : शब्द एवं अनुच्छेद (हिन्दी से अंग्रेज़ी)

सूचना : प्रत्येक इकाई 25 अंकों के लिए निर्धारित है।

Suggested Text Books and References

Text book/s: पाठ्यपुस्तक :

1. हिन्दी पाठ्यपुस्तक – रेवा विश्वविद्यालय

References: सन्दर्भग्रन्थ:

1. सुबोधव्यवहारिक हिन्दी – डॉ. कुलदीप गुप्त
2. अभिनवव्यवहारिक हिन्दी – डॉ. परमानन्द गुप्त
3. हिन्दी साहित्य का इतिहास - डॉ. नागेन्द्र
4. आधुनिक हिन्दी साहित्य का इतिहास - डॉ. बच्चन सिंह
5. हिन्दी साहित्य का नवीन इतिहास - डॉ. लाल साहब सिंह
6. शुद्ध हिन्दी के सेबोले के सेलिखे- पृथ्वीनाथ पाण्डे
7. संक्षेपण एवं पल्लवन

Course Code	Course Title	Course Type	L	T	P	C	Hrs./Wk.
B21AHA201	Language II: Additional English – II	FC	1	1	0	2	3

Course Description:

This is a 2-credit course designed to help the learner gain competency in language through an exploration to the various genres of literature. The syllabus is designed to encourage critical ability of the learner to guide them towards career opportunities. This course is intended to develop the capacity to appreciate and assess the various dimensions of society, culture and life.

Prerequisites: The student must possess fair knowledge of language and literature.

Pedagogy: Direct method / ICT / Collaborative Learning / Flipped Classroom.

Course Objectives:

- To assess ecological and environmental concerns through literature.
- To identify the unequal structures of power in society.
- To compare and relate the position of men and women in society.
- To interpret the representation of society in popular culture.

• Course Outcome:

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

- Demonstrate a thorough understanding of sensitive and critical ecological and environmental issues.
- Analyze the rigid structure of center and margin in our society.
- Criticize the subordinate position of women in society.
- Justify the depiction of society in popular culture.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHA201	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			

Course Contents:

Unit-I: Ecology & Environment

7 hrs

Literature: Toru Dutt - Casuarina Tree

Gordon J.L. Ramen – Daffodils No More

C.V. Raman – Water – The Elixir of Life

Language: Degrees of Comparison

Unit-II: Voices from the Margin**6 hrs**

Literature: Tadeusz Rozewicz – Pigtail

Jyoti Lanjewar – Mother

Harriet Jacobs – Excerpt from Incidents in the Life of a Slave Girl

Language: Prefix and Suffix

Unit-III: Women & Society**7 hrs**

Literature: Kamala Das – An Introduction

Rabindranath Tagore – The Exercise Book

Jamaica Kincaid – Girl

Writing Skills: Dialogue Writing

Unit-IV: Popular Culture**6 hrs**

Literature: Rudyard Kipling – The Absent-minded Beggar

Sir Arthur Conan Doyle – The Adventure of Lion's Mane

Aldous Huxley – The Beauty Industry

Writing Skills: Story Writing

Reference Books:

- Agrawal, K.A. *Toru Dutt the Pioneer Spirit of Indian English Poetry - A Critical Study*. Atlantic Publications, 2009.
- Latham, Edward Connery (ed). *The Poetry of Robert Frost*. Holt Paperbacks, 2002.
- Gale, Cengage Learning. *A Study Guide for Tomas Rivera's The Harvest*. Gale, Study Guides, 2017.
- Basu, Tejan Kumar. *The Life and Times of C.V. Raman*. Prabhat Prakashan, 2016.
- Rozewicz, Tadeusz. *New Poems*. Archipelago, 2007.
- Manohar, Murli. *Critical Essays on Dalit Literature*. Atlantic Publishers, 2013.
- Hansda, Sowvendra Shekhar. *The Adivasi Will Not Dance: Stories*. Speaking Tiger Publishing Private Limited, 2017.
- Jacobs, Harriet. *Incidents in the Life of a Slave Girl*. Createspace Independent Publication, 2014.
- Das, Kamala. *Selected Poems*. Penguin Books India, 2014.
- Tagore, Rabindranath. *Selected Short Stories of Rabindranath Tagore*. Maple Press, 2012.
- Gale, Cengage Learning. *A Study Guide for Jamaica Kincaid's Girl*. Gale, Study Guides, 2017.
- Kipling, Rudyard. *The Absent-Minded Beggar*. Hardpress Publishing, 2013.
- Doyle, Arthur Conan. *The Hound of the Baskervilles*. General Press, 2017.
- Dixon, Robert J. *Everyday Dialogues in English*. Prentice Hall India Pvt Ltd., 1988.
- Turton, Nigel D. *ABC of Common Errors*. Mac Millan Publishers, 1995.
- Samson, T. (ed.) *Innovate with English*. Cambridge University Press, 2010.
- Kumar, E Suresh, J. Savitri and P Sreehari (ed). *Effective English*. Pearson Education, 2009.

Course code	Course Title	Course Type	L	T	P	C	Hrs./Wk.
B21AHE201	Communicative English – II	FC	1	1	0	2	3

Course Description:

This 2-credit course focuses on enhancing written proficiency required for professional enhancement. It also polishes the spoken skills of the learners to make them effective and confident presenters. It also addresses the functional aspects of language usage while providing specific linguistic tools through professional language learning software. The practical components discussed in this course enable a fruitful transition from academia to the industry of their choice.

Prerequisites: The student must possess functional knowledge of LSRW skills.

Pedagogy: Direct method, ICT, Collaborative learning, Flipped Classroom.

Course Objectives:

- To build skills essential for corporate communication.
- To enhance context specific language skills.
- To discover the creative linguistic potential through language and literature.
- To develop communication skills necessary for employability.

Course Outcomes:

After the completion of the course, students will be able to:

- Apply acquired skills to communicate effectively in a corporate scenario.
- Demonstrate command over rhetoric of language.
- Develop critical and creative thinking through assimilated language skills.
- Utilize the communication skills learnt to match industry standards.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3
B21AHE201	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			

Course Contents:

Unit-I: Language Acquisition

7 Hrs

Remedial Grammar: Questions & Negatives; Questions Tags

Writing Skills: Email Writing

Activities: Group Discussions

Literature: Alphonse Daudet - The Last Lesson

Unit-II: Persuasive Skills

6 Hrs

Remedial Grammar: Past Simple & Past Perfect

Writing Skills: Report Writing
 Activities: Book & Movie Reviews
 Literature: Lord Alfred Tennyson – Ulysses

Unit-III: Cognitive Skills

7 Hrs

Remedial Grammar: Present & Past Passive; Conditionals
 Writing Skills: Creative Writing
 Activities: Role Plays
 Literature: O. Henry – The Gift of the Magi

Unit-IV: Employability Skills

6 Hrs

Remedial Grammar: Reported Speech; Idioms
 Writing Skills: Cover Letter & CV
 Activities: Exchanging Information
 Literature: Saki – The Open Window

Reference Books:

1. Bansal, R.K. and J.B. Harrison. *Spoken English*. Orient Blackswan, 2013.
2. Raman, Meenakshi and Sangeeta Sharma. *Technical Communication*. Oxford University Press, 2015.
3. Thorpe, Edgar and Showick Thorpe. *Objective English*. Pearson Education, 2013.
4. Dixon, Robert J. *Everyday Dialogues in English*. Prentice Hall India Pvt Ltd., 1988.
5. Turton, Nigel D. *ABC of Common Errors*. Mac Millan Publishers, 1995.
6. Samson, T. (ed.) *Innovate with English*. Cambridge University Press, 2010.
7. Kumar, E Suresh, J. Savitri and P Sreehari (ed). *Effective English*. Pearson Education, 2009.
8. Goodale, Malcolm. *Professional Presentation*. Cambridge University Press, 2013.

Course Code	Bacteriology and Virology	Course Type	L	T	P	C	CH
B21MI0201		HC	2	1	0	3	4

Prerequisites/Pre reading for the course:

Students should have the knowledge of prokaryotic microbes and viruses

Course Objectives:

1. Provide the detailed information of bacteriology and its function.
2. Derive the mathematical hypothesis of bacterial growth dynamics.
3. Provide fundamentals of viruses and its host interactions.
4. Provides various techniques of culturing and characterisation of virus.
- 5.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0201	CO1	2	1	1	2			1	1		3	2	1	1
	CO2	1	2	2	1	2		1		1	2	1	1	1
	CO3	1	2	2	1			1		2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	1	2	2	2	2

Course Outcomes:

After the end of the source students will be able to:

1. Strengthen the knowledge of the morphological details and classification of bacteria
2. Exploit of bacterial growth phases and kinetics involved in growth
3. Explore the biology of virus, phage and their host interactions
4. Explain the various characterisation and identification of virulent viruses

Course Contents

Unit-I Bacteriological studies

12 hrs

Brief history of bacteriology, general characteristics of bacterium, classification of bacteria based on the morphology, flagella and nutritional aspects, ultrastructure of bacterial cells-cell wall composition, cell membrane, flagella, cell surface appendages, genomes & extra chromosomal DNA and functions of bacterial structure.

Unit II Bacterial growth kinetics

12 hrs

Different phases of growth curve-lag, log, stationary, death phases and kinetics, measurement of growth curve, calculation of generation time, reproduction in bacteria-binary fission & its mechanism.

Unit III Virology

12 hrs

Brief history of virology, general characteristics, classification by various methods such as nature of genetic materials, complexities & envelop and their importance, life cycle of bacteriophage (lambda, T4, M13), animal virus (Polio, hepatitis, HIV) and plant virus (TMV, CaMV) importance and scope of virology.

Unit IV Virus culturing techniques

12 hrs

Isolation of virus-different techniques, various methods of culturing-in vitro, in vivo & animal models; different detection methods in the virology-naked, effects & various molecular techniques. Add a note on virioids & prions and their disease caused.

References

1. Prescott L.M, Harley T.P and Klein D.A. Microbiology, 9th Edition, WMC. Brown publishers, 2012
2. Stanier Pub; Ingraham and Wheeler. General Microbiology (1998), 5th edition. McMillan Publisher, 1998

3. Atlas R.M. Microbiology: Fundamentals and applications 4th Edition, Singapore : Pearson Education Asia, 2000
4. Cann A J, Principles of Molecular Virology, Academic Press Oxford UK 2012

Course Code	Chemistry-II	Course Type	L	T	P	C	CH
B21CH0201		HC	2	1	0	3	4

Prerequisites:

Knowledge of atomic structure, electronic configuration, valence electrons, sigma and pi bond, types of reactions, isomerism, properties of liquid and liquid mixtures.

Course Objectives:

1. Understand various interactions in liquid mixtures and their effect on mixture properties.
2. Study the effect of temperature on the behavior of miscible and immiscible liquids.
3. Acquire the concept of fractional distillation, its principles and applications.
4. Fundamental concepts of chemical bonding, Ionic bonding, Covalent Bonding etc.
5. Brief the concepts of binary mixtures, laws of miscibility, fractional distillation etc.
6. Define the concepts of vapour pressure, elevation of boiling points, cryoscopic constant, isotonic solutions, plasmolysis etc.

Course Outcomes:

- CO1: Apply Fajans rules and determine the percentage covalent character of an ionic compound.
 CO2: Categorise the organic cyclic compounds into aromatic, non-aromatic and anti-aromatic character.
 CO3: Draw conclusions from the properties of the solute and solvents and their interactions.
 CO4: Interpret the analytical data and solve problems related to basics of analytical chemistry.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0201	CO1	3	3	2	3			2			1	2	2	
	CO2	3	3	3	2			1			2	2	3	
	CO3	3	2	2	2			2			1	2	3	
	CO4	3	2	1	2			2			3	3	3	

Course Contents:

Unit – I: Chemical Bonding

12 Hrs

Ionic Bonding: Lattice energy and solvation energy. Born-Landé equation, Born-Haber cycle and

its applications. Polarization, polarizing power and polarizability. Fajan's rules, percentage ionic character in covalent compounds, dipole moments. Ionic solids; structure of NaCl and CsCl.

Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. AXE method. Concept of resonance and resonating structures in various inorganic compounds (CO_3^{2-} , SO_3^{2-} , O_3 , HN_3 , CH_2N_2 , N_2O).

MO Approach: Rules for the LCAO method. Molecular orbital diagram for He_2^+ , Be_2 , N_2 , O_2 , O_2^{2-} , O_2^+ , CO and NO (bond order, stability and magnetic properties to be discussed).

Metallic bond: Band theory, electrical conductance of metals, semiconductors (n- and p-type), Insulators and Superconductors. **Hydrogen bonding:** Types and conditions. Hydrogen bonding in HF, H_2O , NH_3 .

UNIT-II

12 Hrs

Aromaticity-Huckel's rule, aromatic, anti-aromatic and non-aromatic character. Aromaticity in benzenoids, (benzene, naphthalene, anthracene and phenanthrene) and non-benzenoid compounds (cyclopropenyl, cyclopentadienyl, cycloheptadienyl system).

Aromatic electrophilic substitution reactions – Arenium mechanism, reactivity and orientation effects in benzene substituents- electron donating groups ($-\text{CH}_3$, $-\text{Cl}$, and $-\text{OH}$ groups) and electron withdrawing groups ($-\text{NO}_2$, and $-\text{SO}_3\text{H}$ groups). Friedel-craft alkylation and acylation.

Aromatic nucleophilic substitution via benzyne intermediate, mechanism with evidences for the formation of benzyne by trapping with anthracene, Birch reduction.

Amines: Classification. Preparation of alkyl and aryl amines-reductive amination of carbonyl compounds, Gabriel phthalimide synthesis. Basicity of amines in aqueous solution: Inductive, resonance, steric and solvation effects on the basicity of amines. Reaction of amines as nucleophiles –Methylation, quaternary salts, Hoffmann elimination with mechanism. Distinguishing reactions of 1° , 2° and 3° amines. Diazotization and synthetic applications of diazonium salts. Sandmeyer's reaction. (conversion to chlorobenzene, bromobenzene and benzonitrile), hydrolysis, reduction (to phenyl hydrazine and aniline), coupling reactions to give azo dyes (*p*-hydroxy azobenzene and 1-phenylazo-2-naphthol).

UNIT-III

12 Hrs

Liquid mixtures: Classification, Raoult's law, Henry's law and its limitations.

Completely miscible liquids: Ideal and non- ideal solutions. Vapor pressure – composition diagrams for ideal and non-ideal solutions. Principle of distillation of binary miscible liquids: Konowaloff's rule, Azeotropic mixtures.

Partially miscible liquids: Critical solution temperature (CST) – types – phenol-water system, triethylamine-water system. Effect of addition of non-volatile solute on CST.

Immiscible liquids: Steam distillation.

Colligative Properties: Relation between relative lowering of vapour pressure and molar mass (to be derived). Determination of relative molar mass of solute by Ostwald-Walker's dynamic method. Elevation of boiling point and its relation to lowering of vapour pressure and molar mass (to be derived, problems to be worked out). Ebullioscopic constant of the solvent and its relation to the boiling point (only equation). Determination of molar mass of the solute by Walker-Lumsden method. Depression in freezing point and its relation to lowering of vapour pressure and molar mass (to be derived, problems to be worked out). Cryoscopic constant and its relation to the melting point

(equation). Determination of molar mass of a non-volatile solute by Beckmann's method (problems to be worked out).

Semi permeable membrane – natural and artificial, preparation of copper ferrocyanide membrane by Morse-Frazer method. Definition of osmosis, osmotic pressure, determination of osmotic pressure by Berkley-Hartley's method. Determination of molar mass from osmotic pressure measurements (relation to be derived, problems to be worked out), isotonic solutions.

UNIT-IV

12 Hrs

Analytical Chemistry:

Principles of qualitative and quantitative analysis; acid-base, oxidation-reduction and complexometric titrations using EDTA; precipitation reactions; use of organic reagents in inorganic analysis.

Indicator – Definitions, types (acid-base, redox, adsorption indicators), examples for each type. Theory of indicators – Oswald's theory and Quinonoid theory – indicator constant – action of phenolphthalein and methyl orange in acid-base solutions – pH titration curves for strong acid vs strong base, weak acid vs strong base, weak base vs strong acid, choice of indicators in these types of titrations – colour change and pH range.

Statistical treatment of results of quantitative analysis: Classification of errors, accuracy, precision, minimization of errors (calibration of apparatus, running of blank determination, running parallel determination to be mentioned), significant figures and computation, mean and standard deviation (explanation with an example), distribution of random errors (explanation with the help of curve), reliability of results (F-test and t-test).

References:

1. R.L. Madan, Chemistry for Degree Students, S. Chand, 1st Edition, 2011.
2. A. Bahl, and B.S. Bahl, Advanced Organic Chemistry, S. Chand, 2010.
3. A. Bahl, and B.S. Bahl, Advanced Physical Chemistry, S. Chand, 2010.
4. J.N. Gurtu and A. Gurtu, Advanced Physical Chemistry, Pragati Prakashan, Vol I, 4th Edition, 2017.
5. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Vishal Publishing Co., 33rd Edition, 2020.
6. P.A. Sykes, Guide book to Mechanism in Organic Chemistry, Orient Longman, New Delhi, 1988.
7. R.T. Morrison and R.N. Boyd, Organic Chemistry, Pearson, 2010.
8. B.H. Mahan, University Chemistry, Narosa, 3rd Edition, 1998.
9. J.D. Lee, Concise Inorganic Chemistry, Oxford University Press, 3rd Edition, 2008.
10. F.A. Cotton, G. Wilkinson and P.L. Gaus, Basic Inorganic Chemistry, Wiley, 3rd ed, 1995.

Course Code	Cytogenetics	Course Type	L	T	P	C	CH
B21GN0201		HC	2	1	0	3	4

Prerequisites/Pre reading for the course:

1. Students should have the knowledge of cell organelles.

2. They should have idea about cell cycle.

Course Objectives:

The objective of this Course is to

1. To equip with the knowledge of microscopy.
2. To explore cell biology and its characteristics.
3. To define the structure and organization of eukaryotic chromosomes.
4. To study the mechanism of linkage and recombination.

Course Outcomes:

After the end of the Course students will be able to:

1. Describe the structure and organization of eukaryotic chromosomes.
2. Diagnose the syndromes depending on karyotypic data.
3. Understand the mechanism of linkage and recombination.
4. Explain the inheritance followed by non-nuclear genes

Mapping of Course Outcomes with programme Outcomes

Course Code		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GN0201	CO1	3	3	3	3				3		3	3	2	
	CO2	3	3	3	3		2		2		3	3	2	2
	CO3	3	3								3	3	2	
	CO4	3	3			3			3		3	3	2	

Course Contents:

UNIT I

12 hrs

Microscopy: Magnification, Resolving power, Principles and Applications of Simple, Compound, Stereozoom, Phase contrast, Fluorescent and Electron microscopes, confocal microscopy.

Cell organelles: Ultrastructure, Chemical composition and Functions of Cytoplasmic organelles: Plasma membrane, Endoplasmic reticulum, Ribosomes, Lysosomes, Golgi bodies and Nucleus. Cell cycle and cell division. Apoptosis (extrinsic and intrinsic mechanisms). Chromosome theory of inheritance.

UNIT II

12 hrs

Eukaryotic Chromosome: Macro-molecular organization. Primary and Secondary constriction, Sat-bodies, Telomeres, Heterochromatin and Euchromatin and its significance.

Ultra structure of Chromosome - Histones, DNA, Nucleosome model, solenoid, scaffold, domains.

Special types of Chromosomes: Structure and Significance of: Polytene Chromosome - Salivary gland chromosome in *Drosophila*, Lampbrush chromosome in amphibian Oocyte. B Chromosome.

UNIT III**12 hrs**

Linkage: Definition of Linkage, Coupling and Repulsion hypothesis, Linkage group- *Drosophila*, maize and man, Types of linkage-complete linkage and incomplete linkage, Factors affecting linkage- distance between genes, age, temperature, radiation, sex, chemicals and nutrition, Significance of linkage.

Crossing over: Crossing over- definition and types of crossing over: Germinal and Somatic crossing over. Crossing over in *Drosophila*. Cytological basis of crossing over: Stern's experiments in *Drosophila*, Creighton and McClintock experiment in maize. Mechanism of crossing over: Chiasma type theory, Breakage first theory, Contact first theory, Strain or torsion theory. Molecular mechanism of crossing over - Holliday model, Interference and coincidence, Steps in Construction of genetic map (*Drosophila*).

UNIT IV**12hrs**

Sex linkage: Definition of sex linkage; Sex linkage in *Drosophila*. Sex linked genes in poultry, moths and man. Sex linked inheritance in man (Colour-blindness, Haemophilia).

Meiotic behavior of chromosome and non - disjunction. Bridge's theory of non-disjunction. Attached X-chromosome.

Extra Chromosomal Inheritance / Cytoplasmic Inheritance: Characteristic features of Cytoplasmic Inheritance. Maternal effect inheritance. Structure and organization of Mitochondria and Chloroplast Inheritance of: Mitochondrial DNA, Chloroplast DNA, Kappa articles in *Paramecium*, Sigma factor in *Drosophila*, Shell coiling in snail. Cytoplasmic Male Sterility (CMS) in maize.

Reference Books:

1. Cytogenetics, Plant Breeding and evolution by U. Sinha and Sunita Sinha, Vikas Publishing House Private, Limited, 1998.
2. Cytology, Genetics and Molecular Biology by P. K. Gupta (2002), Rastogi publications.
3. Elements of Genetics by Phundan Singh, Kalyani Publishers. 2009.
4. Genetic Maps, 6th edition by O'Brien, S (1993) Book 3: Lower Eukaryotes. Book 4: Nonhuman Vertebrates. Book 5: The Human maps. Book 6: Plants. Cold Spring Harbor Lab press New York.
5. Genetics, 2nd Edition, by Weaver, R.F. and Hendrick, P.W. (1992). W.C. Brown.
6. Instant notes in Genetics by P. C. Winter, G.I. Hickey and H. L. Fletcher (2003) Viva Books Pvt.Ltd.
7. Principles of Genetics by E. J. Gardener, M. J. Simmons and D.P. Snustad. J. Wiley and Sons pubs (1998).

CourseCode	Analytical techniques in Genetics	Course Type	L	T	P	C	CH
B21GNS111		SC	2	1	0	3	4

Prerequisites/Pre reading for the course:

1. Students should have the basic knowledge of biomolecules.

2. They should know the basics of physical and chemical analysis techniques.

Course Objectives:

The Objectives of this course is:

1. To emphasis on the techniques and technologies used in genetics and molecular biology.
2. To understand the different methods used for analysis of biomolecules.
3. To interpret the presence of metabolite.
4. To outline the protocol used for different analysis

Course Outcomes:

By the end of the Course students will be able to:

1. Visualize the microscopic images and document them effectively.
2. Blueprint the techniques used to detect proteins and DNA.
3. Understand the techniques of spectroscopy and computational biology.
4. Interpret the presence of metabolite using chromatographic techniques.

Mapping of Course Outcomes with program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GNS111	CO1	3	3	3			2	3			3	3		
	CO2	3	3	3			2	3			3	2	3	
	CO3	3	3	3			2	2			3		3	
	CO4	3	3	3			2	2			3	2	3	

Course Contents:

Unit-I

12 hrs

Microscopy: Light Microscopy-Introduction, Geometrical optics, Image formation, Magnification and Resolution, Lens aberrations, Distortion of image and curvature of field; Types of microscopes-Compound, Bright field and dark field, Fluorescence, Polarized, Stereo, their basic principles, working and applications; Electron Microscopy-Introduction, Historical review, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Theory and basic principles, Instrumentation, applications. FISH – Fluorescence In situ Hybridization and FACS – Fluorescence Activated Cell Sorter

Unit -II

12 hrs

Chromosome banding - Principles and techniques of nucleic acid hybridization and cot curves; Sequencing of nucleic acids; Southern, Northern and Western blotting techniques; Protein sequencing, Polymerase chain reaction (PCR), Real Time-PCR, Methods for measuring nucleic acid and protein interaction. Electrophoresis: Principle, procedure and application of-Agarose, PAGE, SDS-PAGE, Pulse field electrophoresis, Paper cellulose acetate and High voltage electrophoresis; Isoelectric focusing (IEF).

Unit -III**12 hrs**

Biophysical methods: Analysis of biomolecules using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy; Structure determination using X-ray diffraction and NMR analysis using light scattering; Different types of mass spectrometry and surface plasma resonance methods; Computation methods; Nucleic acid and protein sequence databases, data mining method for sequence searches, motif analysis and prediction.

Unit -IV**12 hrs**

Principle and applications of gel filtration, ion exchange & affinity chromatography; Thin layer chromatography; Gas chromatography; GLC; High pressure liquid chromatography (HPLC), Fast protein liquid chromatography (FPLC); Ultracentrifugation (Velocity and buoyant density). Radioactivity, detection and measurement, construction and use of scintillation counters, Autoradiography, preparation of labelled compounds. Applications in biological sciences, use of non-radioactive compounds.

References:

- Molecular cloning A Laboratory Manual 3rd edition Vol. 1, 2, 3-Sambrook and Russell, Churchill press 20072.
- Principles and Techniques of Biochemistry and Molecular Biology (2010)-Edited by Keith Wilson and John Walker, Sixth Edition, Cambridge University Press.
- Chromosome Structural analysis (1999) -A Practical Approach (Ed.) W.A. Bickmore, Oxford University Press5. The AGT Cytogenetics Lab Manual (1997) 3rded. -, Barch, Knutsen and Spurbeck, Lippincott Raven publications.
- Techniques in lifesciences D. B. Tembhare; Himalaya publishing house
- Principles of Gene Manipulation and Genomics; S B Primrose and R M Twyman; seventh edition; Blackwell publishing.

Course Code	Forensic Biology	Course Type	L	T	P	C	CH
B21GNS112		SC	2	1	0	3	4

Prerequisites/Pre reading for the course:

1. Students should have Critical thinking capacity.
2. They should have knowledge of crime scene.

Course Objectives:

The Objectives of this course is:

1. To teach the methodology involved in forensic investigation.
2. To understand and utilize the facilities available at forensic laboratories.
3. To document and analyze the crime scene.
4. To analyze the biological and entomological evidences for interpretation.

Course Outcomes:

By the end of the Course students will be able to:

1. Outline the protocol of forensic science investigation.
2. Involve in forensic investigation.
3. Categorize the evidences and analyze them.
4. Explore the significance of different biological evidences and their significance in interpretation.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GNS112	CO1	3	3	3			3				3	3	3	3
	CO2	3	3	3	3		3	3			3	3	3	3
	CO3	3	3	3	3		3				3	3	2	
	CO4	3	3	3	3		3	3	3		3	3	3	3

Course Contents:

UNIT-1

12 Hrs

Introduction: Scope and future prospects of forensic sciences - Forensic science Laboratories – CFSL & SFSL

Types of crime scenes – indoor and outdoor. Securing and isolating the crime scene. Crime scene search methods. Safety measures at crime scenes. Legal considerations at crime scenes.

Documentation of crime scenes – photography, videography, sketching and recording notes.

Duties of first responders at crime scenes. Coordination between police personnel and forensic scientists at crime scenes.

Crime Scene Evidence - Classification of crime scene evidence - physical and trace evidence.

Locard principle. Collection, labeling, sealing of evidence. Hazardous evidence. Preservation of evidence. Chain of custody. Reconstruction of crime scene.

UNIT-II

12Hrs

Biological Evidence

Nature and importance of biological evidence. Types and identification of microbial organisms of forensic significance. Identification of wood, leaves, pollens and juices as botanical evidence. Diatoms and their forensic significance. Dermatoglyphics. Wildlife Forensics - Fundamentals of wildlife forensic. Illegal trading in wildlife items, such as skin, fur, bone, horn, teeth, flowers and plants. Identification of physical evidence pertaining to wildlife forensics. Forensic entomology - Insects of forensic importance. Collection of entomological evidence during death investigations.

UNIT-III

12 Hrs

Forensic Serology

Forensic characterization of bloodstains. Typing of dried stains. Blood enzymes and proteins. Composition, functions and forensic significance of saliva, sweat, semen, milk and urine. Tests for their identifications.

Bloodstain Pattern Analysis - Bloodstain characteristics. Impact bloodstain patterns. Cast off bloodstain patterns. Projected bloodstain patterns. Contact bloodstain patterns. Blood trails. Bloodstain drying times. Documentation of bloodstain pattern evidence. Crime scene reconstruction with the aid of bloodstain pattern analysis.

UNIT IV Genetic Marker Analysis

12 Hrs

Cellular antigens. ABO blood groups. Extracellular proteins and intracellular enzymes. Significance of genetic marker typing data. Sexual assault investigations. Principles of heredity. Genetics of paternity. DNA markers in forensics. DNA testing in disputed paternity. Missing body cases. Reference populations and databases.

Reference Books:

1. Richard Saferstein, 2001, Criminalistic: An Introduction to Forensic Science. 7th edition Prentice-Hall, New Jersey.
2. Evidence in Civil and Criminal cases, IV edition, Foundation Press, Westbury, New York.
3. James, S.H. and Nordby J.J. Forensic Science: An introduction to Scientific and investigative techniques, CRC Press, USA, 2003.
4. Chowdhri, S., Forensic Biology B.P.R. & D, Govt. of India.
5. Najjar and NacWillim, 1978. Forensic Authropology.
6. Byrd, J.H. and Cartner, J.L., 2001. Forensic Entomology, CRC Press, LIC.
7. Robertson, J., 1999. Forensic Examination of Hair. Taylor & Forensic.
8. Cammins, H. and Middle C., 1961. Fingerprints Palms and Soles. Dover Publications.

Course Code	Environmental Science	L	T	P	C
B21ASM201		2	0	0	2

Prerequisites:

Basic knowledge of Environmental Science studied at higher secondary & school level.

Course Objectives:

1. Discuss Foster clear awareness and concern about economic, social, political and ecological interdependence in urban and rural area
2. Influence the new patterns of behaviors of individuals, groups and society as a whole towards the environment
3. List the knowledge values, attitudes, commitment and skills needed to protect and improve the environment
4. Elaborate the evaluation of the environmental measures and education programs.

Course Outcomes:

On successful completion of this course, the student will be able to:

1. Adapt the environmental conditions and protectit
2. Estimate the role of individual, government and NGO in environmentalprotection.
3. Interpret the new renewable energy resources with high efficiency throughactive research.
4. Analyze the ecological imbalances and protectit.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21ASM201	CO1	1	2	1	1	1	2	3	1	1	1	1	2	1
	CO2	1	3	1	1	1	3	3	1	1	1	1	3	1
	CO3	2	3	2	1	3	3	3	1	1	1	2	3	2
	CO4	1	2	1	1	1	2	3	1	1	1	1	2	1

Course Contents:

Unit-I

6 Hrs

Multidisciplinary Nature of Environmental Studies: Introduction to Environment, objectives and guiding principles of environmental education, Components of environment, Structure of atmosphere, Sustainable environment/Development, Impact of technology on the environment in terms of modern agricultural practices and industrialization, Environmental Impact Assessment.

Environmental protection – Role of Government-Assignments of MOEF, Functions of central and state boards, Institutions in Environment and People in Environment, Initiative and Role of Non-government organizations in India andworld.

Self study: Need for public awareness on the environment, Gaia Hypothesis.

Unit-II

6 Hrs

Environmental pollution, degradation & Waste management:

Environmental Pollution – Definition, sources and types, Pollutant-Definition & classification, Concepts of air pollution, water pollution, Soil pollution, Automobile Pollution-Causes, Effects & control measures.

Self study: Case studies of London smog, Bhopal gas tragedy, marine pollutions and study of different waste water treatment processes.

Environmental degradation – Introduction, Global warming and greenhouse effect, Acid rain-formation & effects, Ozone depletion in stratosphere and its effect.

Solid Waste management – Municipal solid waste, Biomedical waste, Industrial solid waste and Electronic waste (E-Waste). **Self study:** Disaster management, early warning systems-bio indicators for Tsunami and other naturaldisasters.

Unit-III

6Hrs

Energy & Natural resources:

Energy – Definition, classification of energy resources, electromagnetic radiation-features and

applications, Conventional/Non-renewable sources – Fossil fuels based (Coal, petroleum & natural gas), nuclear energy, non-conventional/renewable sources – Solar, wind, hydro, biogas, biomass, geothermal, ocean thermal energy, Hydrogen as an alternative as a future source of energy.

Self study: Remote sensing and its applications, Chernobyl (USSR) nuclear disaster and Fukushima (Japan) nuclear disaster.

Natural resources –water resource (Global water resource distribution, Water conservation methods, Water quality parameters, Uses of water and its importance), Mineral resources (Types of minerals, Methods of mining & impacts of mining activities), Forest wealth (Importance's, Deforestation-Causes, effects and controlling measures)

Self study: Hydrology & modern methods adopted for mining activities.

Unit-IV

6Hrs

Ecology and ecosystem:

Ecology-Definition, branches, objectives and classification, Concept of an ecosystem – Structure and functions, Characteristics of an Ecosystem-Ecosystem Resilience, Ecological succession and productivity, Balanced ecosystem, Components of ecosystem-abiotic and biotic, biological diversity. Biogeochemical cycles and its environmental significance – Carbon, nitrogen and phosphorus cycle, Energy flow in ecosystem, food chains –types, food web & Ecological Pyramids.

Self study: Need for balanced ecosystem and restoration of degraded ecosystems.

Reference Books

1. "Environmental Studies", by R.J. Ranjit Daniels and Jagadish Krishnaswamy, (2017), Wiley India Private Ltd., New Delhi, Co-authored & Customised by Dr. M. S. Reddy & Chandrashekar, REVA University.
2. "Environmental Studies", by R.J. Ranjit Daniels and Jagadish Krishnaswamy, (2009), Wiley India Private Ltd., New Delhi.
3. "Environmental Studies" by Benny Joseph, Tata McGraw – Hill Publishing Company Limited.
4. Environmental Studies by Dr. S. M. Prakash, Elite Publishers Mangalore, 2007
5. Rajagopalan R. 2005, "Environmental Studies – from Crisis to Cure", Oxford University Press.
6. Environmental Science by Arvind walia, Kalyani Publications, 2009.
7. Environmental Studies by Anilkumar Dey and Arnabkumar Dey.

Course Code	Bacteriology & Virology Lab	Course Type	L	T	P	C	CH
B21MI0202		HC	0	0	1.5	1.5	3

Course Objectives:

1. Provides working skills to handle various techniques for isolation of bacteria and viruses
2. Provides the various enumeration methods for bacteria and phages

3. Analyse different biochemical techniques to identify bacteria.
4. Quantify the microorganisms present in the given samples.

Course Outcomes:

After the end of the course students will be able to:

1. Explore various sampling techniques and restoration for bacterial and viral specimens
2. Learn the handle the bacteria and viruses in laboratory
3. Exploit biochemical and molecular techniques to identify, characterise and phylogenetic analysis of bacteria and viruses.
4. Determine the microbial load in the various sample.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO2	PSO3
B21MI0202	CO1	2	1	1	2			1	1		3	2	1	
	CO2	1	2	2	1			1			2	1	1	1
	CO3	1	2	2	1	1	2	1		2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	1

Course Contents

1. Sampling of bacteria- baiting, enrichment and selective isolation
2. Microscopic identification of bacteria
3. Selective identification of bacteria
4. Direct cell count and estimation of microbes
5. Biochemical identification of bacteria
6. Phylogenetic identification of bacteria
7. Isolation of bacteriophage
8. Plaque forming assay

References

1. Stanier Pub; Ingraham and Wheeler. General Microbiology (1998), 5th edition. McMillan Publisher, 1998
2. Atlas R.M. Microbiology: Fundamentals and applications 4th Edition, Singapore : Pearson Education Asia, 2000
3. Cann A J, Principles of Molecular Virology, Academic Press Oxford UK 2012
4. Wagner EK, Hewlett MJ, Bloom DC, Camerini D Basic Virology 3rd edition. Blackwell publishing. Malden USA 2008

CourseCode	Chemistry – II Practicals	Course Type	L	T	P	C	CH
B21CH0202		HC	0	0	1.5	1.5	3

Prerequisites:

Knowledge of physical properties, functional groups, solubility chart, elements and chemical reactions,

Course Objectives:

1. Obtain skill of handling strong acids and reagents used for functional group analysis.
2. Perform independently detection of elements, solubility of the compound, functional group analysis and preparation of suitable solid derivative.
3. Perform the distinguishing test between aldehyde and ketone using Schiff's reagent.
4. Prepare some organic compounds and purification using recrystallization technique.

Course Outcomes:

CO1: Acquire knowledge of steps involved in organic functional group analysis.

CO2: Test for elements such as sulfur, nitrogen and halogens using sodium fusion extract.

CO3: Determine the physical constants of both compound and its derivative using melting point apparatus.

CO4: Setup organic reactions, isolation and purification of organic compounds.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0202	CO1	2	2	3	2	1		2			2	1	3	1
	CO2	3	3	3	3	1		2			3	2	2	2
	CO3	3	2	2	3			2			2	3	2	2
	CO4	2	3	2	2	1		2			3	2	2	2

Course Contents:

Part 1: Qualitative analysis of mono functional organic compounds through functional group analysis. Determination of physical constant. Preparation of suitable solid derivative of the following class.

1. Acids,
2. Alcohols,
3. Aldehydes,
4. Amide,
5. Amine,
6. Halogenated hydrocarbons,
7. Hydrocarbons,
8. Ketones,
9. Nitro compounds,
10. Phenols.

Part 2: Organic preparations: Recrystallisation and determination of melting point and its importance may be mentioned

1. Acetylation: Preparation of acetanilide from aniline
2. Oxidation: Preparation of benzoin acid from benzaldehyde
3. Nitration: Preparation of m-dinitrobenzene from benzene
4. Esterification: Preparation of methyl benzoate from benzoic acid.

References:

1. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
2. Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.
3. Pandey, O.P., Bajpai D. N. & Giri S. *Practical Chemistry, Revised Edition*, (For BSc. I, II, III Year Students of All Indian Universities) S. Chand Company Pvt Limited, 2014.
4. Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).

CourseCode	Cytogenetics Lab	Course Type	L	T	P	C	CH
B21GN0202		HC	0	0	1.5	1.5	3

Course Objectives:

1. To enable students to handle the microscopes.
2. To familiarize the cell division processes.
3. To learn the culturing of *Drosophila*
4. To study the structure of chromosomes.

Course Outcomes:

After the end of the Course students will be able to:

1. Handle the microscopes and observe the live and fixed specimens.
2. Understand the stages of meiosis and mitosis.
3. Culture and maintain the *Drosophila* in laboratory.
4. Familiarize the structure of polytene chromomsomes.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GN0202	CO1	3		3	3						3	3	2	3
	CO2	3	3								3	3	2	
	CO3	3				3					3	3		
	CO4	3	3			3					3	3	2	

Course Contents

1. Microscopy: Handling of Dissection& Simple Microscope.
2. Stereozoom and Compound Microscopes.
3. Temporary squash preparation of onion root tips for mitosis.
- 4.. Temporary squash preparation of onion flower buds for meiosis.
5. Culturing and Handling of *Drosophila*:
 - a) Media Preparation
 - b) Cleaning and Sterilization of bottles
 - c) Handling of *Drosophila*
6. Morphology and Sexual dimorphism
7. Salivary gland Chromosome-
Dissection of Salivary glands and Preparation of Polytene chromosome.
8. Problems on:
 - a. Sex linkage
 - b. Genetic map

Reference Books:

1. Cytogenetics, Plant Breeding and evolution by U. Sinha and Sunita Sinha, Vikas Publishing House Private, Limited, 1998.
2. Cytology, Genetics and Molecular Biology by P. K. Gupta (2002), Rastogi publications.
3. Elements of Genetics by Phundan Singh, Kalyani Publishers. 2009.
4. Genetic Maps, 6th edition by O'Brien, S (1993) Book 3: Lower Eukaryotes. Book 4: Nonhuman Vertebrates. Book 5: The Human maps. Book 6: Plants. Cold Spring Harbor Lab press New York.
5. Genetics, 2nd Edition, by Weaver, R.F. and Hendrick, P.W. (1992). W.C. Brown.
6. Instant notes in Genetics by P. C. Winter, G.I. Hickey and H.L. Fletcher (2003) Viva Books Pvt.Ltd.
7. Principles of Genetics by E.J. Gardener, M.J. Simmons and D.P. Snustad.J. Wiley and Sons pubs (1998).

THIRD SEMESTER

Course code	Course Title	Course Type	L	T	P	C	Hrs./Wk.
B21AHK301	Language III: Kannada - III	FC	1	1	0	2	3

Course Description:

ಭಾಷೆಯನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗೂ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪ್ರಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಸಾಹಿತ್ಯ, ಕಲೆ, ವಾಣಿಜ್ಯ, ಆಡಳಿತಾತ್ಮಕ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ಮೊದಲ ಎರಡು ಸೆಮಿಸ್ಟರ್ ಮೂರು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು; ಮೂರು ಮತ್ತು ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ ಎರಡು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು ಹೊಂದಿದೆ.

Pre-requisites:

- ಕನ್ನಡ ಭಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಅಗತ್ಯ..
- ಭಾಷೆಯನ್ನು ಓದಲು ಮತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು.

- ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು.

Pedagogy:

- Direct method
- ICT and Digital support
- Collaborative and Cooperative learning
- Differentiated Instruction
- Flipped Classroom

Course Objectives:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೊದಲನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

- ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
- ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಮೂಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.
- ಅವರಲ್ಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಬರಾಣ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಬರಾಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ.
- ಸ್ವದರ್ಶಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

Course Outcomes:

ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನದ ವಿವಿಧ ಪ್ರಕಾರದ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

- ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ, ಪರಿಸರ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ, ವಿಚಾರಗಳೆಡೆ ಗಮನ ಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಬಾವವು ಬೆಳೆಯುತ್ತದೆ.
- ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇದಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
- ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.
- ಸಂಶೋಧನಾ ಮನೋಬಾವ ಮತ್ತು ಸ್ವದರ್ಶಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸುತ್ತದೆ.

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHK301	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			

Course Content:

Unit I ನವೋದಯ ಕವಿತೆಗಳು

7 Hrs

1. ಬೆಳಗು ದ.ರಾ. ಬೇಂದ್ರೆ
 ೨. ಕಲ್ಪ ಕುವೆಂಪು
 ೩. ಕನ್ನಡ ಪದಗೋಳ ಜಿ. ಪಿ. ರಾಜರತ್ನಂ

Unit II ನವೋದಯ ಹಾಗೂ ನವ್ಯ ಕವಿತೆಗಳು

7 Hrs

1. ಅವಧೂತ ಸು.ರಂ.ಎಕ್ಕಂಡಿ
 ೨. ಮನೆಯಿಂದ ಮನೆಗೆ ಕೆ.ಎಸ್.ನ
 ೩. ನನ್ನ ಹಣತೆ ಜಿ.ಎಸ್.ಎಸ್.

Unit III ಸಣ್ಣ ಕಥೆಗಳು

6 Hrs

1. ದಾಳಿ ನಡೆದಾವ ಅಣ್ಣಾ ಅಮರೇಶ ನುಗಡೋಣಿ
 ೨. ಕೊನೆಯ ಗಿರಾಕಿ ನಿರಂಜನ
 ೩. ಮಾನೀಟರ್ ತೇಜಸ್ವಿ

Unit IV ನಾಟಕ

6 Hrs

1. ಮೀಡಿಯಾ (ಸಂಗ್ರಹ) ಯುರಿಪಿಡೀಸ್ ಅನುವಾದ: ಕೆ. ಮರುಳ ಸಿದ್ಧಪ

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು :

೧. ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. ೨೦೧೪
 ೨. ಸೀಮಾಂತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ ೧,೨,೩,೪,೫ ಮತ್ತು ೬, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. ೨೦೧೪
 ೩. ಡಾ. ಅರವಿಂದ ಮಾಲಗತ್ತಿ, ಸಾಹಿತ್ಯ ಸಂಸ್ಕೃತಿ ಮತ್ತು ದಲಿತ ಪ್ರಜ್ಞೆ, ಪ್ರಕಾಶಕರು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. ೨೦೧೪
 ೪. ಡಾ. ಈ.ಎಸ್. ಅಮೂರ, ಕನ್ನಡ ಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. ೨೦೧೬
 ೫. ಕೀರ್ತನಾಧ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಟ್ರಸ್ಟ್, ಧಾರವಾಡ. ೨೦೦೯
 ೬. ಸಂ. ಬಿ.ಎಸ್. ಕೇಶವರಾವ್, ಕೈಲಾಸಂ ಕನ್ನಡ ನಾಟಕಗಳು, ಪ್ರಕಾಶಕರು ಅಂಕಿತ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. ೨೦೦೫
 ೭. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು -೨೦೧೪
 ೮. ಅಧುನಿಕ ಕನ್ನಡ ಕಾವ್ಯ ಭಾಗ-೨, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. ೨೦೦೪
 ೯. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. ೨೦೧೩

Course Code	Course Title	Course Type	L	T	P	C	Hrs./ Wk.
B21AHH301	Language-III: Hindi - III	FC	1	1	0	2	3

Course description: अध्ययनवर्णन :

यहपाठ्यक्रमनौसिखिया,

अपनीभाषाकीक्षमताकाविकासकरनेहेतुतथाविभिन्नसाहित्यिकप्रक्रियाओंद्वारासमाज, संस्कृतिएवंजीवनकेमूल्योंकोसमझनेहेतुअभिकल्पितहै।

Prerequisites/Pre reading for the course:पूर्वपेक्षा:

- अध्येताको, हिन्दीनाटकसाहित्यकासंक्षिप्तज्ञानआवश्यकहै।
- हिन्दीसाहित्यकेइतिहासकासंक्षिप्तज्ञानकीआवश्यकताहै।
- हिन्दीव्याकरणकाअवबोधनआवश्यकहै।

- मीडिया लेखन की बुनियादी जानकारी चाहिए।
- अंग्रेजी – हिन्दी अनुवाद से संबंधित जानकारी जरूरी है।

c) Pedagogy: शिक्षाशास्त्र :

- Direct method
- ICT and Digital support
- Collaborative and Cooperative learning
- Differentiated Instruction
- Flipped Classroom

Course Objectives: पाठ्यक्रम उद्देश्य:

- संदर्भानुसार उचित भाषा का प्रयोग करने की दक्षता को छात्रों में उत्पन्न करना।
- साहित्य के माध्यम से समाज एवं मानवीय मूल्यों को समझाकर, उन मूल्यों की रक्षा हेतु प्रेरित करना।
- छात्रों में पुस्तक पठन एवं लेखन की अकृतिम प्रवृत्ति स्थापित करना।
- अध्येताओं में साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास करना।

Course Outcomes : अधिगम परिणाम:

अध्ययन की समाप्ति पर अध्येता –

- सामाजिक मूल्य एवं नैतिक जवाबदेही को स्वीकार कर सकता है।
- साहित्य की प्रासंगिकता को जीवन में समझने की दक्षता रखता है।
- समाज में अंतर्निहित पद्धतियाँ एवं विचारधाराओं का व्याख्यान करने में सक्षम बन सकता है।
- साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास कर सकता है।

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3
B21AHH301	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			

Course content

इकाई-1: नाटक: एक और द्रोणाचार्य- डॉ. शंकर शेष

7 hrs

लेखक परिचय

प्रथम दृश्य

द्वितीय दृश्य

इकाई-2 : नाटक: एक और द्रोणाचार्य

7 hrs

तृतीय दृश्य

चतुर्थ दृश्य

इकाई-3: नाटक: एक और द्रोणाचार्य
पंचमदृश्य
छठादृश्य

6 hrs

इकाई-4:
अनुवाद : अंग्रेजी - हिन्दी-समाचारपत्रसंबंध

6 hrs

सूचना : प्रत्येक इकाई 25 अंकों के लिए निर्धारित है।

Suggested Text Books and References

Text book/s: पाठ्यपुस्तक :

1. एक और द्रोणाचार्य – डॉ. शंकरशेष

References: सन्दर्भग्रन्थ:

1. मीडिया लेखन एवं जनसंचार – डॉ. संजीव कुमार
2. हिन्दी साहित्य का इतिहास - डॉ. नागेन्द्र
3. आधुनिक हिन्दी साहित्य का इतिहास - डॉ. बच्चन सिंह
4. हिन्दी साहित्य का नवीन इतिहास - डॉ. लाल साहब सिंह
5. शुद्ध हिन्दी कैसे बोले कैसे लिखे- पृथ्वीनाथ पाण्डे
6. कार्यालय अनुवाद निदेशिका
7. मीडिया विमर्श – रामशरण जोशी
8. संस्कृति- जनसंचार और बाजार, नन्द भरद्वाज

Course Code	Course Title	Course Type	L	T	P	C	Hrs./Wk.
B21AHA301	Language III: Additional English - III	FC	1	1	0	2	3

Course Description:

This 2-credit course allows the learners to explore the various socio-political aspects represented in literature. The concepts discussed in the course provide learning exposure to real life scenarios. The course is designed to develop critical thinking ability among learners, through the socio-political aspects discussed in literature. Thus, the aim is to produce responsible and sensitive individuals.

Prerequisites: The student must possess fair knowledge of language, literature and society.

Pedagogy: Direct method / ICT / Collaborative Learning / Flipped Classroom.

Course Objectives:

- To outline the global and local concerns of gender and identity.

- To identify the complexities of human emotions through literature.
- To assess the struggles of human survival throughout history.
- To compare and contrast between the various dimensions of childhood.

Course Outcome:

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

- Evaluate the pressing gender issues within our society.
- Criticize human actions through a humane and tolerant approach.
- Perceive the human conflicts with an empathetic perspective.
- Disprove the assumption of a privileged childhood.

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHA301	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			

Course Contents:

Unit-I: Gender & Identity

7 hrs

Anne Sexton – Consorting with Angels

Eugene Field – The Doll’s Wooing

Vijay Dan Detha – Double Life

Charlotte Perkins Gilman – The Yellow Wallpaper

Unit-II: Love & Romance

6 hrs

Alfred Noyes – The Highway Man

William Shakespeare – Sonnet 116

Frank Richard Stockton – The Lady or the Tiger?

Oscar Wilde – The Nightingale and the Rose

Unit-III: War & Trauma

7 hrs

Lord Alfred Tennyson – The Charge of the Light Brigade

Taufiq Rafat – The Medal

Guy de Maupassant – Two Friends

Sadaat Hasan Manto – Toba Tek Singh

Unit-IV: Children’s Literature

6 hrs

William Blake – The Chimney Sweeper

D.H. Lawrence – Discord in Childhood

Anna Sewell – The Black Beauty (Extract)

Rudyard Kipling – The Jungle Book (Extract)

Reference Books:

- Sexton, Anne. *The Complete Poems*. Houghton Mifflin, 1999.
- Namjoshi, Suniti. *Feminist Fables*. Spinifex Press, 1998.
- Vanita, Ruth & Saleem Kidwai (ed.) *Same Sex Love in India*. Penguin India, 2008.
- Gilman, Charlotte Perkins. *The Yellow Wallpaper*. Rockland Press, 2017.
- Gale, Cengage Learning. *A Study Guide for Alfred Noyes's "The Highwayman"*. Gale, Study Guides, 2017. (Kindle Edition Available)
- Shakespeare, William. *Poems and Sonnets of William Shakespeare*. Cosimo Classics, 2007.
- Stockton, Frank Richard. *The Lady, or the Tiger?* Createspace Independent Publications, 2017.
- Wilde, Oscar. *The Collected Works of Oscar Wilde*. Wordsworth Editions Ltd., 1997.
- Tennyson, Lord Alfred. *The Complete Works of Alfred Tennyson*. Forgotten Books, 2017.
- Blake, William Erdman, David V. (ed.). *The Complete Poetry and Prose* (Newly revised ed.). Anchor Books, (1988).
- Maupassant, Guy de. *Guy de Maupassant-The Complete Short Stories*. Projapati, 2015.
- Manto, Sadaat Hasan. *Manto: Selected Short Stories*. RHI, 2012.
- Ricks, Christopher. *Metaphysical Poetry*. Penguin, 2006.
- Sewell, Anna. *The Black Beauty*. Maple Press, 2014.
- Kipling, Rudyard. *The Jungle Book*. Amazing Reads, 2018.

Course Code	Eukaryotic Microbiology	Course Type	L	T	P	C	CH
B21MI0301		HC	2	1	0	3	4

Prerequisites/Pre reading for the course:

Students should have the knowledge of prokaryotes and eukaryotes

Course Objectives:

1. Provides the information on the basis of eukaryotic microorganisms
2. Strengthen the knowledge of biology of fungal kingdom
3. Familiarise the morphological and biological characteristics of algal kingdom
4. Understand the parasites and their disease related to protozoans.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0301	CO1	2	1	1	2			1	1		3	2	1	
	CO2	1	2	2	1	2	2	1		1	2	1	1	1
	CO3	1	2	2	1	2	3	1		2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	1	2	2	2	1

Course Outcomes:

After the end of the course students will be able to

1. Learn eukaryotic microorganisms and their characteristics
2. Gain the knowledge about the fungal kingdoms and their applications
3. Strengthen their knowledge of algae and its nutritional importance's
4. Understand the host-parasite interactions and its virulence factors

Course Contents:

Unit I Eukaryotic microbes

12 hrs

Eukaryotic microorganisms – Major differences between prokaryotes & eukaryotes, Classification and major differences among eukaryotic microbes (Fungi, Algae, Protozoa) general characteristics and significance of eukaryotic microbes

Unit II Mycology

12 hrs

Fungal characteristics, growth, reproduction, life cycle, classification & importance. Study of thallus structure, reproduction and life cycle of the following fungi - *Pythium*, *Rhizopus*, *Saccharomyces*, *Aspergillus*, *Penicillium*, *Fusarium* and *Agaricus*. Major applications of fungi in various fields

Unit III Phycology

12 hrs

Algae characteristics, structures, growth, reproduction, life cycle, classification & importance. Study of thallus structure, reproduction and life cycle of the following: Cyanobacteria, Chlorella, Scenedesmus, Spirogyra, Diatoms and Gracilaria. Major applications of algae in the various fields

Unit-IV Parasitology

12 hrs

Evolution and the parasite-host relationship and its significant & parasites of humans Introduction, structure and reproduction of –. Important diseases caused by protozoans – malaria & trichomoniasis.

References

1. Microbiological Techniques (2005) Aneja.
2. Introductory Mycology by Alexopoulos CJ, Mims CW and Blackwell M. (2012) 3rd Ed., John Wiley and Sons.
3. Sumbali G. (2005). The Fungi. 2nd edition. Narosa Publishing India House
4. Webster J and Weber (2000). Introduction to Fungi. 3rd edition. Cambridge University Press.
5. Lee RE. (1999). Phycology. 4th edition. Cambridge Press
6. Barasanti L and Gualtieri P. (2006). Algae: Anatomy Biochemistry and Biotechnology. Taylor and Francis Group, New York
7. Kumar HD. Introductory Phycology (2007) 2nd Ed., Affiliated East Western Press.

Course Code	Chemistry–III	Course Type	L	T	P	C	CH
B21CH0301		HC	3	0	0	3	4

Prerequisites:

Knowledge of chemical bonding, periodic table, stereochemistry, thermodynamics.

Course Objectives:

1. Learn the structure and bonding in following compounds of Boron, Carbon, Nitrogen, Sulphur and halogens.
2. Understand the classification of the following topics Alkyl halides, aryl halides, alcohols, phenols, carbonyl compounds
3. Explore the fundamental knowledge about electrolytes, common ion effect, ionization constant and salt hydrolysis.
4. Develop the knowledge about various laws of thermodynamics, heat capacity, bond energy, carnot cycle etc

Course Outcomes:

Upon successful completion of this course, students will be able to:

CO1: Illustrate the nature of bonding in metal carbonyls, boron, halogens and its properties, identify different functional groups.

CO2: Understand the nomenclature, different reactions and its mechanism of various named reactions.

CO3: Classify the electrolytes based on Debye Huckle theory and discussing about asymmetric effect and electrophoretic effect, etc.

CO4: Conclude the limitations and postulates of various thermodynamic laws, working of carnot cycle.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0301	CO1	1	2	1	1	1	1	1			1	2	2	
	CO2	2	2	1	1	1	1	1			1	2	2	
	CO3	1	2	1	2	2	2	2			1	1	1	
	CO4	2	1	1	2	1	2	2			1	1	2	

Course Contents:**Unit-I:****12 Hrs****Chemistry of Non-Metals:**

Boron: Compounds of boron – diborane, BF_3 , Borazole, and boric acid, preparation, structure and uses.

Carbon: Fullerenes – production, structure of C_{60} and C_{70} . CNT, Fullerenes, molecular sieves.

Silicon: Structure of silica. Silicates – types and structure with one example for each type.

Nitrogen: Preparation, properties, structure and applications of hydrazine, hydroxyl amine.

Sulphur: Preparation, properties, structures and applications of thionyl chloride, sulphuryl chloride.

Halogens: Bleaching powder – preparation, properties and structure.

Pseudo halogens: Preparation, properties and structure of cyanogen and thiocyanogen.

Interhalogens: Preparation, properties and structure of ClF_3 and IF_7 .

Lanthanides and Actinides: Electronic configuration, atomic and ionic sizes, lanthanide contraction and its consequences. Oxidation states, spectral and magnetic properties, comparison of oxidation states, complex formation and magnetic properties of d and f block elements. Ion exchange method for separation of Lanthanides.

Unit-II:

12 Hrs

Alcohols: Definition and classification, oxidation reaction (CrO_3 , Jones reagent, PCC) reduction reaction, glycols, glycerols, and thiols.

Phenols: Definition, classification with examples, acidity of phenols, effect of substituents on acidity of phenols. Mechanism of Reimer-Tiemann reaction and Kolbe reaction. Industrial applications of phenols (as drug).

Carboxylic acids: Definition, Classification with examples. Homologation of carboxylic acid - Arndt-Eistert reaction.

Carbonyl Compounds: Distinguish between aldehydes and ketones – oxidation ($\text{K}_2\text{Cr}_2\text{O}_7$) and reduction (H_2Pt , LiAlH_4) method. Mechanism of aldol condensation (Ex: acetaldehyde), Perkins reaction, Cannizzaro reaction, Michael-addition reaction, Wittig reaction, Claisen condensation, Knoevenagel reaction.

Tautomerism and Enolates: Keto-Enol tautomerism. Acidity of alpha-hydrogen atoms in aldehydes, ketones and active methylene compounds (example diethyl malonate and ethyl acetoacetate). Preparation of (from acetic acid) and synthetic applications of diethyl malonate. Preparation of - butanoic acid, Adipic acid, cinnamic acid and butanone. Preparation and applications of ethyl acetoacetate.

Ethers: Williamson ether synthesis, reactions – cleavage and auto-oxidation, estimation of number of methoxy groups by Ziesel's method. Cyclic and crown ethers.

Unit-III:

12 Hrs

Ionic equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono-, di- and triprotic acids (exact treatment).

Salt hydrolysis - calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson-Hasselbalch equation and its applications; buffer capacity, buffer range, buffer action and applications of buffers in analytical chemistry and biochemical processes in the human body.

Solubility and solubility product of sparingly soluble salts –applications of solubility product principle. Qualitative treatment of acid –base titration curves (calculation of pH at various stages). Theory of acid–base indicators; selection of indicators and their limitations.

Unit-IV:

12 Hrs

Basic Thermodynamics: Definition of thermodynamic terms: Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work. Zeroth Law of thermodynamics, First law of thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule’s law – Joule – Thomson coefficient for ideal gas and real gas: and inversion temperature. Temperature dependence of enthalpy, Kirchhoff’s equation. Bond energies and applications of bond energies.

Second Law of Thermodynamics: Limitations of First Law of Thermodynamics – need for II Law of thermodynamics, spontaneous, non-spontaneous and equilibrium processes, different ways of stating II Law, heat engine (example) Carnot cycle, efficiency of Carnot cycle(derivation), concept of entropy – definition and physical significances of entropy – criteria of spontaneity in terms of entropy change, statements of II law in terms of entropy (numerical problems to be worked out on entropy and efficiency of Carnot engine).

Suggested Text Books:

1. A. Bahl and B.S. Bahl, Advanced Organic Chemistry, S. Chand, 2010.
2. A. Bahl and B.S. Bahl, Advanced Physical Chemistry, S. Chand, 2010.
3. J.N. Gurtu and Aayushi Gurtu, Undergraduate Physical Chemistry, Vol I, Vol II and Vol III Pragati Prakashan.
4. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, Milestone Publications & Distributors, 33rd Edition, 2018.
5. S.P. Banerjee, Advanced Inorganic Chemistry, Books and Allied (p) Ltd, 2nd Edition, 2017.
6. N.N. Greenwood and A. Earnshaw, Chemistry of the Elements, Pergamon Press, 2nd Edition, 1989.
7. P.A. Sykes, Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).

Course Code	Molecular Genetics	Course Type	L	T	P	C	CH
B21GN0301		HC	2	1	0	3	4

Prerequisites/Pre reading for the course:

1. Students should have the knowledge of DNA structure and chromosomes.
2. They should know the concept of central dogma of molecular biology.

Course Objectives:

The objective of this Course is:

1. To study the discovery and structure of the genetic material.

2. To understand the processes of gene expression and gene regulation.
3. To facilitate students to understand the concept of microbial genetics.
4. To investigate the causes of genetic diseases.

Course Outcomes:

After the end of the Course students will be able to

1. Understand the characteristics of nucleic acids.
2. Illustrate the processes of gene expression and various stages of gene regulation.
3. Understand the inheritance pattern in bacteria.
4. Associate the mutations linked with several disorders.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GN0301	CO1	3	3				3		3		3	3	2	
	CO2	3	3	3	3	3	3		3		3	3	3	
	CO3	3	3	3		3	3		0		3	3	2	
	CO4	3	3	3	3		3		3		3	3	2	

Course Contents:

UNIT I

12 hrs

a. Chemical Basis of Heredity:

DNA as genetic material- Experiments of Griffith; Avery, McLeod and McCarty; Hershey and Chase. RNA as genetic material- Experiment of Fraenkel and Singer.

Nucleic acids:

Molecular structure of DNA, Chargaff's rule, Forms of DNA- A, B and Z forms.

RNA types and structure – mRNA, tRNA (clover leaf model), rRNA, and other types and their significance Ribozymes **DNA Replication:** Meselson and Stahl Experiment.

DNA Replication in prokaryotes – Initiation, Continuous and discontinuous synthesis, Events at the replication fork, Termination, Enzymology of DNA replication. Rolling circle replication. DNA Replication in eukaryotes.

UNIT II

12 hrs

Gene expression:

Transcription: Prokaryotes and eukaryotes initiation, elongation and termination (rho- dependent and rho- independent).

Post transcriptional modifications: methylation, polyadenylation, RNA splicing.

Translation: Prokaryotes and eukaryotes, Genetic code and its properties; process of translation- Initiation, elongation and termination. Post-translational modifications of proteins.

Protein sorting

UNIT III

12 hrs

Gene regulation:

Concept of operon, Inducible operon – Lac operon – structure and mechanism, Catabolite repression. Repressible operon – Tryptophan operon – structure and mechanism.

Epigenetic Regulation of Gene Expression: Overview of epigenetic regulation; Chromatin remodelling and gene expression; Histone modifications and gene expression; Small RNA based epigenetic regulation; Propagation of epigenetic regulation (genome imprinting).

UNIT IV

12 hrs

Mutations:

Introduction and Types of Gene mutations – Base substitution (Transition and transversion), Frame shift mutation, insertion, deletion, missense, nonsense, reverse, suppressor and lethal mutations). Pleiotropy- definition and examples.

Mutagens – Physical (ionizing and non- ionizing radiations) and chemical (Base analogs, Alkylating agents, Acridine dyes, Deaminating agents, Hydroxylating agents, Tobacco carcinogens); Oncogenic Viruses.

DNA repair mechanisms (Mismatch repair, photoreactivation, excision and SOS repair).

Mutation as raw material for evolution. Beneficial effects of mutation.

References Books:

1. Advanced Genetics by G.S. Miglani. 2002.
2. Advanced Molecular Biology by Twyman R.M (1998) Viva Books Ltd.
3. Cell Biology and Molecular Biology by EDP Robertis and EMF Robertis, Saunder College. 1980.
4. Genes- IX, 9th Ed., Benjamin Lewin. Jones and Bartlett Publishers, 2008.
5. Genetics – Analysis of Genes and genomes – VII edition – Daniel L. Hartl and Elizabeth W. Jones. 2011.
6. Genetics – from genes to genomics – Leland Hartwell, Leroy Hood, Charles (Chip) Aquadro, Michael L. Goldberg, Maria Papaconstantinou, Fischer, Janice, Jim Karagiannis. McGraw-Hill Education, 2017.
7. Genomes by T.A. Brown (2002) Viva Books.
8. Instant Notes in Molecular Biology by P.C. Turner et al (2002) Viva Books.
9. Molecular cell Biology, 2nd edition by Darnell.J, H. Lodish and D. Baltimore (1990), Scientific American Books, New York.
10. Molecular Genetics by D.N. Bharadwaj. Kalyani, 2008

Course Code	Hetero Cyclic Chemistry & Chemistry of Natural Products	Course Type	L	T	P	C	CH
B21CHS311		SC	3	0	0	3	4

Prerequisites:

Knowledge of hydrocarbons, heteroatoms like S, N, and O, biomolecules like carbohydrates, proteins, vitamins.

Course Objectives:

1. Explain the fundamental concept of structure, bonding and properties in heterocyclic compound.
2. Discuss the structural elucidation of certain organic compounds.
3. Illustrate the chemical route synthesis of some biomolecules (carbohydrates) and natural product.
4. Explain the basic concept of amino acids, types of amino acids and peptides.

Course Outcomes:

1. Analyze the different types, reactivity and aromatic character of heterocyclic compounds
2. Predict the structure and chemical route synthesis of some organic compounds.
3. Classify the different types of aminoacids and their synthesis.
4. Discuss the topics include chemical strategy used to elucidate natural product pathways.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CHS311	CO1	1	1	1	2						1	1	1	
	CO2	1	1	2	3						1	1	1	
	CO3	1	1	1	2						2	1	3	
	CO4	1	1	2	2						2	1	2	

Course Contents:

UNIT-I

12 hrs

Heterocyclic Compounds: Introduction, Nomenclature and classifications, five membered ring compounds with single hetero atom (Ex: pyrrole, furan and thiophene), aromatic character and preparation from 1, 4-di carbonyl compounds, Paul Knorr synthesis. Properties: Acidic character of pyrrole –electrophilic substitution at 2, 5 positions, (nitration, sulphonation and halogenation). Diels-Alder reactions of furan. Pyridine: Structure, basicity, aromaticity-comparison with pyrrole, preparation and properties, reactivity towards nucleophilic substitution reaction.

UNIT-II

12 hrs

Terpenoids: Occurrence, classification and isoprene rule. Structural elucidation and synthesis of citral. Structures of limonene, menthol, α -terpineol, camphor, β carotene and their uses.

Alkaloids: Introduction, classification and general characteristics. Structural elucidation and synthesis of nicotine. Structures and uses of ephedrine, caffeine, cocaine, atropine, quinine and morphine.

Steroids: Introduction, classification, synthesis of cholesterol.

UNIT-III

12 hrs

Carbohydrates: Introduction, Definition, classification based on composition with examples-reducing and non-reducing sugars.

Monosaccharides

Structural elucidation of glucose in detail – evidence for cyclic structure of glucose (aldehyde test and mutarotation) determination of ring size (methylation, hydrolysis and oxidation reactions)

pyranose structures (Haworth and chair conformational formulae) Fischer and Haworth structures of fructose and galactose.

Conversion reactions – 1. Kiliani's synthesis 2. Wohl's degradation.

Disaccharides: Glycosidic bond, structural formulae of maltose and lactose (Haworth structure).

Nucleic Acids

Purine and pyrimidine bases. Structure of nucleosides and nucleotides. Methods of formation of internucleotide bonds (DCC, phosphotriester approach). Biological importance of DNA and RNAs. Protein-nucleic acid interaction chromatin and viral nuclear capsid.

UNIT-IV

12 hrs

Amino acids and proteins:

Introduction, classification- Natural and un-natural amino acids, examples.

Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples – Glycine, Alanine, valine and leucine) by following methods: a) from halogenated carboxylic acid b) Malonic ester synthesis c) strecker's synthesis.

Physical properties: Zwitter ion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point.

Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

Reference Books:

1. R.K. Bansal, Heterocyclic Chemistry, Tata Mcgraw Hill Publications.
2. M.K. Jain, A Text book of Organic Chemistry, S. Chand & Company.
3. Bhal and Bhal, A Text book of Organic Chemistry, S. Chand & Company.
4. P.L. Soni, A Text book of Organic Chemistry, S. Chand & Company.
5. R.K. Bansal, Laboratory Manual of Organic Chemistry, New Age Publications.
6. Jayaraman, Laboratory Manual of Organic Chemistry, S. Chand & Company.
7. A. Goel, Chemistry of Natural products, Publishing House, Meerut.
8. K.K. Sharma, Organic Chemistry, Shobhanlal & Nagan Company.
9. Ashuthosh Kar, Medicinal Chemistry, Tata Mcgraw Hill Publications.

Course Code	Polymer Chemistry	Course Type	L	T	P	C	CH
B21CHS312		SC	3	0	0	3	4

Prerequisites:

Knowledge of monomers, polymers, rubbers, cellulose, inorganic polymers, polymer processing.

Course Objectives:

1. To realize the importance of monomer concept in polymers.
2. Enhance the knowledge foundation concepts of synthesis of various polymeric compounds.
3. Expertize basic concepts in Biopolymers and their fundamental importance.

- Understand reaction kinetics, theory and relevant applications of the polymers.

Course Outcomes:

- Assimilate the appreciate the foundation knowledge of polymer concepts, importance of polymers and molecular weight of the polymeric compounds.
- Design and apply the knowledge of synthesis, applications of polymeric compounds.
- Realization of polymerization foundation in various processes.
- Increase knowledge on biopolymer, synthesis and application.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CHS312	CO1	2	1	1								1	1	
	CO2	2	1	1	1	1						1	1	
	CO3	2	1	1	1	1						1	1	
	CO4	2	1	1	1	1					1	1	1	

Course Contents:

UNIT-I

12hrs

Introduction to polymer Science

History of macromolecular science. Concept of macromolecules. Degree of polymerization, Concept of molecular mass, polydispersity, number average and weight average, viscosity average molecular weight, molecular weight distribution in linear polymers (step growth and chain polymers), Nomenclature of polymers. Basic concepts in polymer science. Different ways in classification of polymers depending on – The origin (natural, Semisynthetic, synthetic etc.), The structure (linear, branched, network, hyperbranched, dendrimer.), The type of atom in the main chain (homochain, heterochain).

The formation (condensation, addition). Homopolymers, copolymers. The behaviour on application of heat and pressure (thermoplastic and Thermosetting). The form and application (plastics, fiber, elastomers and resin). Stereochemistry of polymers, Introduction to two types of polymerization Reactions viz. condensation and addition polymerization (without detailed mechanism and derivations), Monomer structure and polymerizability.

Concept of functionality. Writing the structure of the polymer formed for a given monomer and its classification. Raw materials for monomers with specific example viz. acrylonitrile, vinyl, chloride, methyl methacrylate, isoprene, styrene, hexamethylene diamine and adipic acid, caprolactum, ethylene glycol and their Polymerization reactions.

UNIT-II

12hrs

Inorganic polymers: Definition – examples, general properties, comparison with organic polymers,

Silicones: Definition, nomenclature, preparation (linear, cross- linked and cyclic). Factors affecting the nature of silicon polymers, properties (chemical and thermal stabilities, chemical properties) uses of silicon polymers, silicon fluids/oils – uses, silicon elastomers – rubbers, silicon resins (preparation and uses). Synthesis, structural aspects and applications of siloxanes. Borazines, phosphazenes, and polysulphates.

UNIT-III

12 hrs

Kinetics and Mechanism of Chain Polymerization Processes:

Chain reaction (Addition) polymerization, Free radical addition polymerization mechanism of vinyl polymerization, generation of free radicals, initiation, propagation, termination, chain transfer inhibition of retardation, configuration of monomer units in vinyl polymer chains.

Kinetics of free radical addition polymerization – experimental determination of rate constants, derivations for rate expressions and expressions for kinetic chain length and hence degree of polymerization. Thermodynamics of free radical polymerization, effect of temp and pressure, enthalpies, entropies, free energies, activation energies polymerization. Ionic and coordination chain (addition) polymerization common features of two types of ionic polymerization, Mechanism of cationic polymerization, expressions for overall rate of polymerization and the number average degree of polymerization. Mechanism of anionic, polymerization, expressions for overall rate of polymerization and the average degree of polymerization.

UNIT-IV

12 hrs

Biopolymer Interactions

Synthesis of Biopolymers, Forces involved in biopolymer interaction. Electrostatic charges and molecular expansion, hydrophobic forces, dispersion force interaction. Multiple equilibria and various types of binding processes in biological system. Hydrogen ion titration curve. Thermodynamics of biopolymers. Vant's Hoff's law of osmotic pressure, Theory of osmotic pressure and semipermeability. Behaviour of cells and molecular weight determination from osmotic pressure measurements. Significance of osmosis in biology. Problem solving.

TRANSPORT OF IONS: Ion transport through cell membrane, irreversible thermodynamic treatment of membranetransport.

BIOSENSORS: Definition, types, sensors for environmental, medical, food safety and biosecurity applications.

Reference Books:

1. F.W. Billmeyer, Jr. Textbook of polymer science, Wiley- Interscience, N.Y. 1971.
2. R. Seymour, Introduction to polymer chemistry, Wiley –Interscience, 1981.
3. D.D. Deshpande, Physical chemistry of Macromolecules, Vishal publications, 1985.
4. P.J. Flory, Principles of polymer chemistry, Singer, 2015.
5. V.R. Gowarikar, Polymer Science, Publisher: John Wiley and Sons Ltd, 2012.
6. G. Odian, Principles of polymerization, Wiley – Interscience, 1981.
7. G. Odian, Principles of polymerization, Wiley – Interscience, 1981.
8. K.J. Saunders, Organic polymer chemistry, Chapman and Hall, London, 1973.
9. R.B. Seymour, G. S. Kirshenbaum, High performance polymers, their origin and development, Elsevier, 2012.

10. P.W. Morgan, Condensation polymers by interfacial and solution methods, Interscience publishers, 2010.
11. T.L. Richardson, Industrial plastics: Theory applications, Chapman and Hall, London, 2000.
12. R.W. Lenz, Organic chemistry of synthetic high polymers, Interscience publisher, 2004.

Course Code	Eukaryotic Microbiology Lab	Course Type	L	T	P	C	C
B21MI0302		HC	0	0	1.5	1.5	3

Prerequisites/Pre reading for the course:

Students should have the knowledge of algae, fungi and protozoans

Course Objective:

1. Practical exposure to culture the fungi and with various growth media
2. Explore various isolation techniques for fungi and algae
3. Culturing aspects of industrially important fungi and algae
4. Various staining techniques for parasites.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0302	CO1	2	1	1	2			1	1		3	2	1	1
	CO2	1	2	2	1	2	2	1	1	1	2	1	1	1
	CO3	1	2	2	1	2		1	2	2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	2

Course Outcomes:

By the end of the course the student will be able to:

1. Handle the preparation of growth media and various culturing techniques for fungi and algae
2. Explore the techniques for isolation and identification of specific fungi and algae
3. Explore Biological applications of fungi and algae
4. Identify the virulent parasites and their diseases caused

Course Contents

1. Preparation of medium for fungi-MRBA, PDA & SDA
2. Isolation and identification of Saprophytic fungi
3. Isolation and identification of Endophytic fungi
4. Isolation and identification of plant pathogenic fungi
5. Medium for algae-Basal medium, BG11 & Bristol medium
6. Isolation of Algae & its identification

7. Culturing of microalgae spirulina and SCP estimation
8. Staining of plasmodium and others

References

1. Aneja (2007) Microbiological Techniques
2. Barasanti L and Guaaltieri P (2006). Algae: Anatomy Biochemistry and Biotechnology. Taylor and Francis Group, New York.

Course Code	Chemistry Practical-III	Course Type	L	T	P	C	CH
B21CH0302		HC	0	0	1.5	1.5	3

Prerequisites:

Knowledge of anions and cations, qualitative and quantitative analysis.

Course Objectives:

1. This course is intended to provide basic skills in qualitative analysis at the semi-micro scale.
2. It also emphasizes the importance of organized and systematic approach in carrying out experiments.
3. It also helps in developing analytical reasoning, critical thinking, questioning etc.

Course Outcomes:

1. Identify the individual anions and cat ions in a compound.
2. Apply the knowledge in determining the strength of analyte.
3. Interpret the involvement of intermediate ions while estimating particular group.
4. Solve the reactions involved related to intermediates and product formation during analysis

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0302	CO1	1	2	1	1	1	1	1			1	2	1	1
	CO2	2	2	1	1	1	2	1			2	2	2	2
	CO3	1	2	1	2	2	2	1			1	1	1	1
	CO4	2	1	2	2	1	2	2			2	1	2	2

Course Contents:

Part 1: Systematic semi-micro qualitative analysis of inorganic salt mixture containing two cations and two anions (Minimum 10 mixtures to be analysed).

Anions: HCO_3^- , CO_3^{2-} , SO_3^- , Cl^- , Br^- , NO_3^- , BO_3^{3-} , SO_4^{2-} and PO_4^{3-}

Cations: Pb^{2+} , Bi^{3+} , Cd^{2+} , Al^{3+} , Fe^{3+} , Fe^{2+} , Mn^{2+} , Zn^{2+} , Ba^{2+} , Sr^{2+} , Ca^{2+} , Mg^{2+} , K^+ , Na^+ and NH_4^+ .

Note:

1. Mixture requiring elimination of phosphate and borate should not be given
2. Combination like Cl^- and Br^- , NO_3^- and Br^- shall be avoided.

3. Salts that yield double decomposition shall be avoided (like CaSO_4 , BaSO_4 , FeSO_4).
4. The combination of two cations in the mixture should be to different groups. However, combination like Mg^{2+} and NH_4^+ and Na^+ and NH_4^+ can be given.

Part-2: Inorganic preparation

- a. Preparation of Chloropentaminecobalt (III) chloride
- b. Preparation of Cuprammoniumsulphate
- c. Preparation of Ferric alum
- d. Preparation of ferrous oxalate
- e. Preparation of Prussian blue (ferri ferrocyanide)

Reference Books: Practicals

1. Mendham, J., A. I. Vogel's *Quantitative Chemical Analysis 6th Ed.*, Pearson, 2009.
2. Vogel's *Qualitative Inorganic Analysis*, Revised by G. Svehla. Pearson Education, 2002.

Course Code	Molecular Genetics Lab	Course Type	L	T	P	C	CH
B21GN0302		HC	0	0	1.5	1.5	3

Prerequisites/Pre reading for the course:

1. Students should have the knowledge of centrifugation.
2. They should know the concept of quantification methods.

Course Objective:

The objective of this Course is:

1. To facilitate students to extract DNA and analyze them.
2. To characterize DNA and proteins using electrophoresis.
3. To understand the mechanism of mutations.

Course Outcomes:

After the end of the Course students will be able to

1. Extract and estimate the DNA from different sources.
2. Estimate the DNA and RNA using standard protocols.
3. Characterize DNA and proteins using agarose gel electrophoresis and SDS PAGE.
4. Analyse the genetic disorders.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GN0302	CO1	3	3	3	3			3	3		3	3	2	3
	CO2	3	3	3				3			3	3	2	3
	CO3	3	2	3	3			3			3	3	3	3
	CO4	3	3	3	3		3	3	3		3	3	3	3

Course Contents

1. Genomic DNA isolation in plants – Cauliflower, Coconut endosperm
2. DNA isolation in bacteria
3. DNA isolation in animal – liver
4. Estimation of DNA by Diphenyl amine method
5. Estimation of RNA by Orcinol method
6. Agarose gel electrophoresis
7. SDS PAGE – Poly Acrylamide Gel Electrophoresis
8. Study of mutations:
Sickle cell Anaemia- Mis – sense mutation.
Thalassemia – frame shift mutation.
Identification of point mutation types based on the given representation.

Reference Books:

1. Advanced Genetics by G.S. Miglani. 2002.
2. Advanced Molecular Biology by Twyman R.M (1998) Viva Books Ltd.
3. Cell Biology and Molecular Biology by EDP Robertis and EMF Robertis, Saunder College. 1980.
4. Genes- IX, 9th Ed., Benjamin Lewin. Jones and Bartlett Publishers, 2008.
5. Genetics – Analysis of Genes and genomes – VII edition – Daniel L. Hartl and Elizabeth W. Jones. 2011.
6. Genetics – from genes to genomics – Leland Hartwell, Leroy Hood, Charles (Chip) Aquadro, Michael L. Goldberg, Maria Papaconstantinou, Fischer, Janice, Jim Karagiannis. McGraw-Hill Education, 2017.
7. Genomes by T.A. Brown (2002) Viva Books.
8. Instant Notes in Molecular Biology by P.C. Turneretal (2002) Viva Books.
9. Molecular cell Biology, 2nd edition by Darnell.J, H. Lodish and D. Baltimore (1990), Scientific American Books, New York.
10. Molecular Genetics by D.N. Bharadwaj. Kalyani, 2008

FOURTH SEMESTER

Course code	Course Title	Course Type	L	T	P	C	Hrs./Wk.
B21AHK401	Language IV: Kannada - IV	FC	1	1	0	2	3

Course Overview:

ಭಾಷೆಯನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗೂ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪ್ರಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಸಾಹಿತ್ಯ, ಕಲೆ, ವಾಣಿಜ್ಯ, ಆಡಳಿತಾತ್ಮಕ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ಮೊದಲ ಎರಡು ಸೆಮಿಸ್ಟರ್ ಮೂರು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು; ಮೂರು ಮತ್ತು ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ ಎರಡು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು ಹೊಂದಿದೆ.

Pre0requisites:

- ಕನ್ನಡ ಭಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಅಗತ್ಯ..
- ಭಾಷೆಯನ್ನು ಓದಲು ಮತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು.

- ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು.

Pedagogy: ICT/Blended learning/Direct method/Collaborative/Flipped Classroom.

Course Objectives:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೊದಲನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

- ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
- ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಮೂಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.
- ಅವರಲ್ಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಭಾಷೆ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ
- ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

Course Outcomes:

ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನದ ವಿವಿಧ ಪ್ರಕಾರದ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

- ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ, ಪರಿಸರ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನ ಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
- ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
- ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.
- ಸಂಶೋಧನಾ ಮನೋಭಾವ ಮತ್ತು ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸುತ್ತದೆ.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHK401	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			

Course Content:

Unit I ನವ್ಯಂಸ್ತೀವಾದಿ ಕವಿತೆಗಳು

7 Hrs

೧. ಬುದ್ಧಿವಂತರಿಗೆ ಕನಸು ಬಿದ್ದರೆ ಎ.ಕೆ.ರಾಮನುಜನ್

೨. ಕುರಿಗಳು ಸಾರ್ ಕುರಿಗಳು ಕೆ.ಎಸ್.ನಿಸಾರ್ ಅಹಮದ್

೩. ಅಕ್ಕ ಹೇಳಿದ್ದು ಸ. ಉಷಾ

Unit II ದಲಿತಂಬಡಾಯ

7 Hrs

೧. ನನ್ನ ಕವನಗಳಲ್ಲಿ ಹುಡುಕದಿರು ನನ್ನ ಚಂಪಾ

೨. ದಲಿತರು ಬರುವರು ದಾರಿಬಿಡಿ ಸಿದ್ಧಲಿಂಗಯ್ಯ

೩. ಕಟ್ಟಡದ ಕೆಲಸಗಾರರು ಎಚ್ ಎಸ್ ಶಿವಪ್ರಕಾಶ

Unit III ಲೇಖನಗಳು

6 Hrs

೧. ಹಸಿರು ಹೊಸಕುವ ಗಣಿಗಳು ಯಲ್ಲಪ್ಪ ರೆಡ್ಡಿ

೨. ಜಾಗತೀಕರಣದ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ಗಾಂಧೀಜಿಯ ಪ್ರಸ್ತುತತೆ ಸಿ. ನಾಗಣ್ಣ

೩. ಚಾರ್ವಾಕರು: ಒಂದು ಟಿಪ್ಪಣಿ ಪಿ ಎನ್ ರಂಗನ್

Unit IV ಕಾದಂಬರಿ

6 Hrs

1. ಸಂಸ್ಕಾರ (ಆಯ್ದಭಾಗ) ಯು.ಆರ್. ಅನಂತಮೂರ್ತಿ

Reference Books:

೧. ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. ೨೦೧೪
೨. ಸೀಮಾಂತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ ೧,೨,೩,೪,೫ ಮತ್ತು ೬, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. ೨೦೧೪ ೩. ಡಾ. ಅರವಿಂದ ಮಾಲಗತ್ತಿ, ಸಾಹಿತ್ಯ ಸಂಸ್ಕೃತಿ ಮತ್ತು ದಲಿತ ಪ್ರಜ್ಞೆ, ಪ್ರಕಾಶಕರು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. ೨೦೧೪
೪. ಡಾ. ಈ.ಎಸ್. ಅಮೂರ, ಕನ್ನಡ ಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. ೨೦೧೬
೫. ದೇಶಪಾಂಡೆ ಎಸ್.ಎಲ್., ಬೇಂದ್ರೆ ಶರೀಪ್ಪ ರ ಕಾವ್ಯಯಾನ, ಪ್ರಕಾಶಕರು ದೇಸಿ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. ೨೦೧೩
೬. ಕೀರ್ತನಾಧ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಟ್ರಸ್ಟ್, ದ,ರವಾಡ. ೨೦೦೯
೭. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು ೨೨೦೧೪
೮. ಸಂ. ಡಾ! ಸಿ. ಆರ್. ಚಂದ್ರಶೇಖರ್, ಮುಂದಾಳುತನದ ಲಕ್ಷಣಗಳನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವುದು ಹೇಗೆ?, ಪ್ರಕಾಶಕರು ನವಕರ್ನಾಟಕ ಪಬ್ಲಿಕೇಷನ್ಸ್ ಪ್ರೈವೇಟ್‌ಲಿಮಿಟೆಡ್. ೨೦೧೦
೯. ಆದ,ುನಿಕ ಕನ್ನಡ ಕಾವ್ಯ ಬ,ಗ೦೨, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. ೨೦೦೪
೧೦. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. ೨೦೧೧

Course Code	Course Title	Course Type	L	T	P	C	Hrs
B21AHH401	Language – IV: Hindi - IV	FC	1	1	0	2	3

Course description: अध्ययनवर्णन :

यहपाठ्यक्रमनौसिखिया,

अपनीभाषाकीक्षमताकाविकासकरनेहेतुतथाविभिन्नसाहित्यिकप्रक्रियाओंद्वारासमाज,

संस्कृतिएवंजीवनकेमूल्योंकोसमझनेहेतुअभिकल्पितहै |

Objectives: पाठ्यक्रमउद्देश्य:

- संदर्भानुसारउचितभाषाकाप्रयोगकरनेकीदक्षताकोछात्रोंमेंउत्पन्नकरना |
- साहित्यकेमाध्यमसेसमाजएवंमानवीयमूल्योंकोसमझाकर, उनमूल्योंकीरक्षाहेतुप्रेरितकरना |
- छात्रोंमेंपुस्तकपठनएवंलेखनकीअकृतिमप्रवृत्तिस्थापितकरना |

- अध्येताओंमेंसाहित्यकेमाध्यमसेप्रभावीएवंकुशलसंचारकाविकासकरना।

Learning Outcomes :अधिगमपरिणाम:

अध्ययनकीसमाप्तिपरअध्येता –

- सामाजिकमूल्यएवंनैतिकजवाबदेहीकोस्वीकारकरसकताहै।
- साहित्यकीप्रासंगिकताकोजीवनमेंसमझनेकीदक्षतारखताहै।
- समाजमेंअंतर्निहितपद्धतियाँएवंविचारधाराओंकाव्याख्यानकरनेमेंसक्षमबनसकताहै।
- साहित्यकेमाध्यमसेप्रभावीएवंकुशलसंचारकाविकासकरसकताहै।

c) Pedagogy:सिक्शशास्त्र :

1. Direct method
2. ICT and Digital support
3. Collaborative and Cooperative learning
4. Flipped Classroom

Prerequisites/Pre reading for the course:पूर्वपेक्षा:

- अध्येताको,हिन्दीखंडकाव्यकासंक्षिप्तज्ञानआवश्यकहै।
- हिन्दीसाहित्यकेइतिहासकासंक्षिप्तज्ञानकीआवश्यकताहै।
- हिन्दीव्याकरणकाअवबोधनआवश्यकहै।

• Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHH401	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			

Course Content:अध्ययनविषयसूची / पाठ्यक्रम

इकाई-1:खंड0काव्य – नहुष – मैथिलीशरणगुप्त 7 hrs

कविपरिचय

काव्यपरिचय

शचीसर्ग

नहुषसर्ग

इकाई-2:खंड0काव्य – नहुष – मैथिलीशरणगुप्त 7 hrs

उर्वशीसर्ग

स्वर्गभोगसर्ग

इकाई-3:खंड0काव्य – नहुष – मैथिलीशरणगुप्त 6 hrs

सन्देशसर्ग

मंत्रणासर्ग

पतनसर्ग

इकाई-4:

6 hrs

सिनिमारिव्यू :

सूपर 30, मिशनमंगल, थप्पड़, आर्टिकल 15

सूचना : प्रत्येक इकाई 25 अंक के लिए निर्धारित है।

d) Suggested Text Books and References

Text book/s: पाठ्यपुस्तक:

1. खंडोकाव्य – नहुष – मैथिलीशरणगुप्त

References: सन्दर्भग्रन्थ:

1. रस – छंद – अलंकार 0 कृष्णदेवशर्मा & सुरेश अग्रवाल
2. हिन्दी साहित्य का इतिहास 0 डॉ. नागेन्द्र
3. आधुनिक हिन्दी साहित्य का इतिहास 0 डॉ. बच्चन सिंह
4. हिन्दी साहित्य का नवीन इतिहास 0 डॉ. लाल साहब सिंह
5. शुद्ध हिन्दी कैसे बोले कैसे लिखे 0 पृथ्वीनाथ पाण्डे
6. मीडिया विमर्श – रामशरण जोशी

Course Code	Course Title	Course Type	L	T	P	C	Hrs./Wk.
B21AHA401	Language IV: Additional English -IV	FC	1	1	0	2	3

Course Description:

This 20 credit course helps the learner explore various socio-cultural issues through literature.

The course provides insight on matters like education and culture that are pertinent in the contemporary society. The course also offers multi-dimensional perspective in the genres of literature and contributes for language enrichment.

Prerequisites: The student must possess fair knowledge of language, literature, culture and society.

Pedagogy: Collaborative Method, Flipped Classroom, Blended Learning

Course Objectives:

- To infer the myths from the contemporary perspective.
- To outline the idea of family represented in literature.
- To interpret horror and suspense as a genre of literature.
- To assess the impact of education in building a society.

Course Outcome:

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

- Examine the relevance of myths and mythology.
- Demonstrate family values and ethics essential to live in the society.
- Analyze horror and suspense as a significant genre of literature.
- Evaluate the applicability of academic contribution in building a society.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21AHA401	CO1							2	3		3			
	CO2							2	3		3			
	CO3							2	3		3			
	CO4							2	3		3			

Course Contents:

Unit I: Myths & Mythology

6 hrs

John W. May – Narcissus

W.B. Yeats – The Second Coming

Devdutt Pattanaik 0 *Shikhandi and the Other Stories They Don't Tell you* (Extracts)

Unit II: Family & Relationships

6 hrs

Nissim Ezekiel – Night of the Scorpion

Langston Hughes – Mother to Son

Kate Chopin – The Story of an Hour

Henrik Ibsen – A Doll's House (Extract)

Unit III: Horror & Suspense

7 hrs

Edgar Allan Poe – The Raven

Bram Stoker – A Dream of Red Hands

Satyajit Ray – Adventures of Feluda (Extract)

Unit IV: Education

7 hrs

The Dalai Lama – The Paradox of Our Times

Kamala Wijeratne – To a Student

Sudha Murthy – In Sahyadri Hills, a Lesson in Humility

Frigyes Karinthy – Refund

Reference Books:

- Finneran, Richard J. *The Collected Works of W.B. Yeats*(Volume I: The Poems: Revised Second Edition). Simon & Schuster, 1996.
- Pattanaik, Devdutt. *Shikhandi: And Other 'Queer' Tales They Don't Tell You*. Penguin Books, 2014.
- Ezekiel, Nissim. *Collected Poems* (With A New Introduction By John Thieme). OUP, 2005.

- Hughes, Langston. *The Collected Poems of Langston Hughes*. Vintage, 1995.
- Chopin, Kate. *The Awakening and Selected Stories of Kate Chopin*. Simon & Schuster, 2004.
- Ibsen, Henrik. *A Doll's House*. Maple Press, 2011.
- Poe, Edgar Allan. *The Complete Poetry of Edgar Allan Poe*. Penguin USA, 2008.
- Stoker, Bram. *Dracula*. Fingerprint Publishing, 2013.
- Ray, Satyajit. *The Complete Adventures of Feluda* (Vol. 2). Penguin Books Ltd., 2015.
- Lama, Dalai. *Freedom In Exile: The Autobiography of the Dalai Lama of Tibet*. Little, Brown Book Group, 1998.
- Murthy, Sudha. *Wise and Otherwise: A Salute to Life*. Penguin India, 2006.

Course Code	Environmental Microbiology	Course Type	L	T	P	C	CH
B21MI0401		HC	2	1	0	3	4

Prerequisites/Pre reading for the course:

Students should have the knowledge of microbes in the environment.

Course Objectives:

1. Understand the microorganism and evolution in the nature.
2. Provide the fundamental microbial process in the environment
3. Understand the various types of interaction of microorganisms in the ecosystem.
4. Explore the beneficial microorganisms for ecosystem management.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0401	CO1	2	1	1	2			1	1		3	2	1	
	CO2	1	2	2	1			1			2	1	1	1
	CO3	1	2	2	1			1			2	1	1	2
	CO4	1	1	2	2	1	1	2	1		2	2	2	

Course Outcomes:

By the end of the course the student will be able to:

1. Strengthen the knowledge of microorganisms and their role in the environment.
2. Analyse the microbiological process associated in environment and ecosystem maintenance.
3. Explore the various interactions of the microorganisms in the ecosystem.
4. Exploit the various microorganisms and their products for environment management

Course Contents:

Unit-I Introduction to Environmental Microbiology

12hrs

Microbes in the environment. Water microbiology: Waste water treatment: methods: aerobic and anaerobic processes. Solid waste management; Landfills, containment types, Composting and applications. Bioremediation and phytoremediation: biofilters, Microbial polymers, microbial plastics. Bioaccumulation, Biomagnification, Marine pollution: concepts and remediation strategies.

Unit II Biogeochemical process in environment

12hrs

Biogeochemical cycles, Carbon cycle, organic matter decomposition, humus formation, Nitrogen cycle - nitrogen fixation, ammonification, nitrification, denitrification, reactions – organisms involved. Nitrogen fixation – symbiotic - root nodulation, non-symbiotic, associative organisms, nitrogenase, hydrogenase, nif gene, nod gene. Microbial transformation of phosphorus, solubilization by phosphobacteria and P- mobilization by mycorrhizal fungi, Microbial transformation of sulphur - sulphur toxicity and sulphur bacteria.

Unit-III Microbe interactions in ecosystem and diversity

12hrs

Interaction between soil microbes–Neutralism, Commensalism, Symbiosis, Synergism, Amensalism, Parasitism, Predation and Competition. Interrelationships between soil microbes and plants, Rhizosphere concept, R:S ratio, rhizoplane; spermosphere; phyllosphere, Mycorrhizae-types, Rumen flora, Insects microbial interactions.

Unit-IV Microorganisms for ecosystem maintenance

12hrs

Bioremediation: Concepts and principles, bioremediation using microbes, in situ and ex situ bioremediation, biosorption and bioaccumulation of heavy metals. Xenobiotics: Degradation by microorganisms with reference to pesticides, herbicides, polyaromatic hydrocarbons. Relevance of GMO to the environment. Current status of biotechnology in environment protection.

References

1. Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott.
3. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., (2008) Molecular Biology of the Gene (VI Edition.). Cold Spring Harbour Lab. Press, Pearson Pub.

Course Code	Chemistry –IV	Course Type	L	T	P	C	CH
B21CH0401		HC	3	0	0	3	4

Prerequisites:

Periodic table, Stereochemistry, Electrochemistry and Chemical kinetics.

Course Objectives:

1. The importance of acid-base concept, HSBA rule in compound formation, non-aqueous solvent and noble gas chemistry
2. The fundamental concepts of organic chemistry synthesis of various functional organic compounds
3. Illustrate the Vital concepts thermodynamics and its principles and its importance.
4. Correlate the reaction kinetics and foundation theory and relevant applications.

Course Outcomes:

On the successful completion of this course, the student shall be able to:

1. Apply the knowledge of noble gases, compounds of N, S and pseudo halogens in explaining, interpreting structures and their reactivities of noble gases and organometallic compounds.
2. Analyze the bonding stability organic compounds and their applications.
3. Recognize the typical named organic reactions and explain their mechanisms through various steps.
4. Correlate the importance of adsorption and catalysis reactions of chemical compounds in industries e.g. Hydrogenation, dehydrogenation.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0401	CO1	1	2	1	1	1	1	1			1	2	1	
	CO2	2	2	1	1	1	2	1			1	2	2	
	CO3	1	2	1	2	1	2	1			1	1	1	
	CO4	2	1	1	2	1	1	2			1	1	2	

Course Contents:

UNIT-I

12 Hrs

Noble Gases: Preparation, separation of Noble gases-Dewar's method. Preparation, Structure and properties of compounds of Xenon and Krypton (XeF_2 , XeO_3 , KrF_2 , KrO_3), Clathrates (explanation with suitable examples, essential conditions for the formation and uses).

Organometallic Compounds: Definition with example, Organo magnesium and organolithium compounds: preparation and synthetic applications. Metal carbonyls: Definition, classification with examples, nature of M-CO bonding in carbonyls. nitrosyls and metallocenes.

Bioinorganic Chemistry: Essentials and trace elements of life; basic reactions in the biological systems and the role of metal ions, especially Fe^{2+} , Fe^{3+} , Cu^{2+} and Zn^{2+} ; structure and function of hemoglobin and myoglobin and carbonic anhydrase.

Non-aqueous solvents: classification of solvents, Liquid ammonia-reasons for the solvent properties, typical reactions- solubility of alkali metals; acid-base, precipitation, Ionization of weak acids, advantages and disadvantages.

UNIT-II

12 Hrs

Stereochemistry – Introduction, Stereo isomerism; Optical isomerism; Symmetry and chirality; Absolute and relative configuration. D and L. Enantiomers and diastereomers; Racemic mixture, racemisation and resolution. Threo and erythro; CIP Rules: R/S and E-Z system of nomenclature. Optical isomerism in compounds with stereocenters (lactic acid and tartaric acid) and without any

stereocenters (allenes, biphenyls); atropisomerism. conformation of acyclic systems (substituted ethane/n-propane/n-butane) and cyclic systems (mono- and di-substituted cyclohexanes).

Pericyclic and photochemical reactions:

Pericyclic reactions: Introduction. Classification of pericyclic reactions, electro cyclic reactions- con rotation and dis rotation. Electro cyclic closure and opening in $4n$ and $4n+2$ π systems.

Organic Photochemistry: Introduction, types of photochemical reactions-laws of photochemistry, photo dissociation - isomerization- cyclisation- dimerization and oxetane formation. Norrish-I and II reactions. Barton reaction- photo Fries rearrangement, Paterno Buchi reaction.

UNIT-III

12 Hrs

Free Energy: Helmholtz and Gibb's free energy – their definitions and their relationship, Gibb's – Helmholtz equation at constant pressure and volume, thermodynamic criteria of equilibrium and spontaneity, Claussius – Clappeyron equation, integrated form of Claussius – Clappeyron equation (to be assumed) and its applications (enthalpy of vapourization, boiling point and freezing point at different temperatures), Van't Hoff's reaction isotherms and isochore equations.

Adsorption: Introduction, principle involved. Sorption, absorption and adsorption (statement, differences and examples) physical and chemical adsorption – definition and differences. Adsorption of gases on solids – factors which influence, types of adsorption, factors affecting adsorption. Free energy change in adsorption, Adsorption isotherms –Freundlich's isotherm and Langmuir's adsorption. Equation of Langmuir's adsorption isotherm, BET equation (derivation not required) applications.

Catalysis-types, general characteristics, homogeneous and heterogeneous catalysis. Theories of catalysis, intermediate compound formation theory and adsorption theory. Enzyme catalysis –lock and key mechanism with example. Michaelis-Menton enzyme catalytic equation, Industrial applications of enzymes and catalysts.

UNIT-IV

12 Hrs

Chemical Kinetics: Rate of reaction, rate equation, factors influencing the rate of a reaction. Order of a reaction, integrated rate expression for zero order, first order, second and third order reaction. Half-life period of a reaction. Methods of determination of order of reaction, effect of temperature on the rate of reaction – Arrhenius equation. Theories of reaction rate – Simple collision theory for unimolecular and bimolecular collision (hard sphere model). Transition state theory of bimolecular reactions.

Electrochemistry: Electrolytic conduction, factors affecting electrolytic conduction, specific, conductance, molar conductance, equivalent conductance and relation among them, their variation with concentration. Arrhenius theory of ionization, Ostwald's Dilution Law. Debye- Hückel – Onsager's equation for strong electrolytes (elementary treatment only) Transport number, definition and determination by Hittorfs methods, (numerical included), Kohlrausch's Law, calculation of molar ionic conductance and effect of viscosity temperature & pressure on it. Applications of Kohlrausch's Law: Calculation of conductance of weak electrolytes at infinite dilution, determination of degree of dissociation, determination of K_a of acids and determination of solubility product of sparingly soluble salts.

Reference Books:

1. D.W. Ball, Physical Chemistry, Thomson Press, India, 2007.
2. G.W. Castellan, Physical Chemistry, 4th Ed. Narosa, 2004.
3. B.S. Bahl, A. Bhal, G. D. Tuli, Essentials of Physical Chemistry, S. Chand & Company Edition 2006.
4. Gurudeep Raj, Advanced Physical Chemistry, Goel Publication
5. M.K. Jain, A Text book of Organic Chemistry, S. Chand & Company.
6. A. Bhal and B.S. Bhal, A Text book of Organic Chemistry, Chand & Company.
7. P.L. Soni, A Text book of Organic Chemistry, S. Chand & Company.
8. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, Shobhanlal Nagin Chand Co.
9. Gurudeep Raj, A Text book of Inorganic Chemistry.
10. J.D. Lee, Concise Inorganic Chemistry, B-Block Well Science Ltd.

Course Code	Developmental Genetics	Course Type	L	T	P	C	CH
B21GN0401		HC	2	1	0	3	4

Prerequisites/Pre reading for the course:

1. Students should have the knowledge of developmental process.
2. Students should be familiar with gene expression.

Course Objectives:

The objective of this Course is to

1. To learn the essentials of developmental biology.
2. To get familiarized with the embryonic development.
3. To distinguish the organogenesis and metamorphosis.
4. To study the developmental disorders.

Course Outcomes:

After the end of the Course students will be able to:

1. Differentiate the developmental stages.
2. Compare the developmental milestones of different organisms.
3. Illustrate the phenomenon of organogenesis and metamorphosis.
4. Outline the characteristics of developmental disorders.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GN0401	CO1	3	3	3		3	2	2			3	3	2	
	CO2	3	3				2				3	3		
	CO3	3	3	3	3	3	2				3	3	2	
	CO4	3	3	3			3	3	2		3	3	2	

Course Contents:

UNIT-I

12 hrs

Essential Concepts in Developmental Biology

Early embryonic development in Frog, Gametogenesis, fertilization, cleavage, blastula and gastrula. Nuclear transplantation experiments in Amphibians and *Acetabularia*. Epigenesis and preformation - Generating new cells and organs — Cell-cell communication in development – Fate Maps.

UNIT-II

12 hrs

Embryonic Development and Germ Layer Specification

Genetics of development in plants – *Arabidopsis*: Flower development (Floral morphogenesis and Homeotic gene expression).

Genetics of development in Animals - *Drosophila*: Early development; Origin of anterior-posterior and dorso-ventral polarity: Role of Maternal genes, Zygotic genes- Segmentation genes (gap, pair rule and segment polarity genes) and Homeotic selector genes. d. Switching genes on and off during development- Ex. Differential expression of haemoglobin

C. elegans – Early development in Vertebrates – Early mammalian development – Origin and emergence of Ectodermal, Mesodermal and Endodermal cell layers

UNIT-III

12 hrs

Organogenesis and Sex Determination

CNS and epidermis –Neural crest cells – The Somites and their derivatives – Development of tetrapod limb –Development of gonads— Sex determination.

UNIT-IV

12 hrs

Metamorphosis, Regeneration and Ageing

Insect and amphibian metamorphosis – Stem Cell mediated regeneration –

Regeneration in planaria and zebrafish – Biology of senescence – Role of mTOR pathway and telomeres in ageing (gerontology).

Developmental Disorders

Embryonic origins of adult disease - Genetic errors of human development – Teratogenesis – Transgenerational inheritance of developmental disorders – Cancer as a disease of development – Disease models and mechanisms.

Reference Books:

1. Balansky, Text book of embryology.
2. Principles of Development by Lewis Wolpert et al. 5th Edition. oxford University press 2015.
3. Winter, P.C., Hickey, G.I. and Fletcher, H.L. (2002) Genetics, 4th edition, Viva Books
4. Lewin, Benjamin; Krebs, Jocelyn E.; Goldstein, Elliott S.; Kilpatrick, Stephen T. (2014),
5. Genes XI, Jones and Bartlett Learning.
6. Brown, T.A., Chapman and Hall (2011) Genetics a Molecular Approach, 2nd edition, Garland science.
7. Gilbert. (2013) Developmental biology. 10th edition.

Course Code	Aeromicrobiology & Aquatic Microbiology	Course Type	L	T	P	C	CH
B21MIS411		SC	2	1	0	3	4

Prerequisites/Pre reading for the course:

Students should have basics of microbes present in the air and water samples.

Course Objectives:

1. Understand the microbial dynamics in the atmospheric air.
2. Explore various sampling methods and enumerating the microbial load in air sample.
3. Learn various water sampling and processing for water quality.
4. Explore various marine microorganisms and their significance.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MIS411	CO1	2	1	1	2			1	1		3	2	1	1
	CO2	1	2	2	1	1	1	1		2	2	1	1	1
	CO3	1	2	2	1	1	1	1		1	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	2

Course Outcomes:

By the end of the course the student will be able to:

1. Analyse the microbial dynamics and their significance in the air samples
2. Explore various methods to study the microbial dynamics in the atmosphere
3. Analyse the normal and polluted water microflora and their significance
4. Explore the various marine microflora and their commercial products.

Course Contents:

Unit-I Introduction to Aeromicrobiology

12 hrs

Definition, history and development of air microflora, aim and scope of aerobiology, geomicrobiology and its importance. Atmospheric layers, sources of microorganisms, air flora of indoor and outdoor environment & its significance, factors affecting air spores and their significance

Unit-II Sampling and isolation techniques

12 hrs

Techniques of trapping air-borne microorganisms-Gravity slide, Petri plate exposure, Vertical cylinder spore trap, Hirst spore trap, Rotorod sampler, Anderson sampler, impingers and filtration, principle and its advantages & disadvantages Air-borne microorganism examples with major disease and their health effects. Air borne disease-4 important diseases and its management.

Unit III Microbiology of Water**12 hrs**

Distribution of microorganisms in the aquatic environment, Determination of sanitary quality of water, Sources of water-borne diseases-viral (jaundice), bacterial (cholera) and protozoan, (amoebic dysentery) Biological indicators of water pollution. Sources, characteristics of waste water-domestic & industrial waste water, Waste water treatment-primary, secondary & tertiary treatment, Solid waste recycling: Anaerobic digestion process, Biogas and composting

Unit IV Marine microbiology**12 hrs**

Marine environment, marine microbial community–planktons, bacteria, fungi, protozoa, Methods of collection and estimation of marine microbes, influence of physical, chemical and biological factors on marine microbes. Marine microbial products-Biosurfactants, biopolymers and enzymes from marine microbes, microbial indicators of marine pollution and control, biofouling, biocorrosion, biofilms, biodegradation and bioremediation of marine pollutants

Reference

1. Madigan MT, Martinko JM and Parker J. (2009). Brock Biology of Microorganisms. 12th edition. Pearson/Benjamin Cummings.
2. Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press
4. Stolp H. (1988). Microbial Ecology: Organisms Habitats Activities. Cambridge University Press, Cambridge, England.
5. Karl, D & Buckley, M (2005) Marine Microbial Diversity
6. Mitchell, R (2008) Microbial Ecology of the Oceans Wiley
7. Colwell, R & Belkin, (2010) Ocean & health: Pathogens of the Marine Environment Springer
8. Miller, C., Wheeler, P.A (2012) Biological Oceanography Wiley-Blackwell
9. Madigan MT, Martinko JM and Parker J. (2009). Brock Biology of Microorganisms. 12th edition. Pearson/Benjamin Cummings.

Course Code	Immunity and Medical Microbiology	Course Type	L	T	P	C	CH
B21MIS412		SC	2	1	0	3	4

Prerequisites/Pre reading for the course:

Students should have basics of Immunology and microbial diseases

Course Objectives:

1. Better understanding of the cells and organs of immune system involved in defence mechanisms.
2. Identification and characterisation of the medically important bacteria.
3. Study the characteristics and transmission of medically important protozoans
4. Understand the control of medical pathogens for the diseases.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MIS412	CO1	2	1	1	2	1	1	1	1	1	3	2	1	1
	CO2	1	2	2	1		2	1	2	2	2	1	1	1
	CO3	1	2	2	1	1	1	1		2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	1

Course Outcomes:

By the end of the course the student will be able to:

1. Have deep knowledge of the cells and organs of immune systems of humans.
2. Understand the pathogenic nature of medicinal bacteria
3. Better understanding of the lifecycle and pathogenesis of the protozoan diseases.
4. Underline concepts and mechanisms for the control of the microbial diseases.

Course Contents:

UNIT-I Introduction to immune system

12 hrs

Innate and Adaptive immunity, Antibody (humoral) mediated immunity, Complement-system and Cell mediated immunity, Cells and tissues of immune system- B&T lymphocytes, phagocytes, killer cells, NK cells, Antigens – nature and types, Antibodies – Structure of IgG. Classes of antibodies and their functional diversity, Antigen-antibody reactions- Agglutination reaction – Widal test, Neutralisation test- Opsonisation, Precipitation reaction-VDRL Test.

UNIT II Bacterial and viral diseases of humans

12 hrs

Pathogen- morphology, cultural and biochemical characteristics, classification, resistance pathogenesis, clinical symptoms, laboratory diagnosis, epidemiology, prophylaxis and treatment of the following: Bacterial diseases – Tuberculosis, Cholera, Typhoid, Syphilis. Viral diseases – Hepatitis, Poliomyelitis, AIDS.

UNIT III Fungal and protozoan diseases of humans

12 hrs

Pathogen-morphology, cultural and biochemical characteristics, classification, resistance pathogenesis, clinical symptoms, laboratory diagnosis, epidemiology, prophylaxis and treatment of the following: Fungal diseases - Candidiasis, Dermatomycosis (Tinea - ringworm infection). Protozoan diseases – Malaria, Trichomoniasis.

UNIT IV Pathogens and their control mechanisms

12 hrs

Normal flora of human body, Infection – types of infection, modes of transmission, Pathogenesis – Virulence – attenuation and exaltation with an example each. Control of pathogenesis and virulence: Antibacterial agents: Inhibitor of nucleic acid synthesis; Inhibitor of cell wall synthesis; Inhibitor of cell membrane function; Inhibitor of protein synthesis; Inhibitor of metabolism.

Antifungal agents: Mechanism of action of Amphotericin B, Griseofulvin. Antiviral agents: Mechanism of action of Amantadine, Acyclovir, Azidothymidine.

Reference

1. Mark Peakman, Basic and Clinical Immunology; Churchill Livingstone. 2 nd Ed., 2009.
2. Collee JG & Mackie TJ (1996) Mackie and McCartney Practical Medical Microbiology.
3. Topley, W.W.C., Wilson, G.S., Parker, T., and Collier, L.H. (1990). Topley and Wilson's Principles of Bacteriology, Virology and Immunology (Edward Arnold)
4. Zinsser, H., and Joklik, W.K. (1992). Zinsser microbiology (Lange) 20th ed.
5. Ananthanarayan, R., and Paniker, C.K.J. (2006). Textbook of microbiology (Orient Blackswan) 7th ed
6. Mackie, T.J., McCartney, J.E., and Collee, J.G. (1989). Mackie & McCartney practical medical microbiology. Churchill Livingstone, 13th ed

Course Code	Environmental Microbiology Lab	Course Type	L	T	P	C	CH
B21MI0402		HC	0	0	1.5	1.5	3

Prerequisites/Pre reading for the course:

Students should have the knowledge of culturing and identification of microbes from various environmental samples.

Course Objectives:

1. Practical handling and determination of dissolved nutrients in water samples.
2. Quantitative and qualitative microbiological analysis of water samples.
3. Explore the various beneficial microorganisms for commercial purpose.
4. Explore various biocontrol agents in control of phytopathogens.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0402	CO1	2	1	1	2			1	1		3	2	1	1
	CO2	1	2	2	1	2	1	1		2	2	1	1	1
	CO3	1	2	2	1	1	2	1		3	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	1

Course Outcomes:

1. Gain hands on experience on the handling of environmental samples for chemical analysis.
2. Analyse the microbiological quality of various water sources.
3. Understand the various beneficial microorganisms for commercial uses.
4. Develop various microbial controls and technologies in the control of plant diseases.

Course Content:

1. Determination of BOD of water samples
2. Microbial qualitative analysis of water-MPN test
3. Isolation and characterisation of root nodulating *Rhizobium spp.*
4. Phosphate solubilising potential of microorganisms
5. Isolation and characterisation of cellulase degrading microorganisms
6. Isolation and characterisation of starch degrading microorganisms.
7. Root nodulation test and effect of fertilisers in nodulation
8. Biocontrol agents test-Trichoderma and Pseudomonas fluorescens

References

1. Rangaswami G and Bagyaraj DJ (2002). Agricultural Microbiology. Second edition, PHI Learning (P) Ltd., New Delhi.
2. Robert, L Tate (1995). Soil Microbiology. First edition, John Wiley and Sons, Inc. New York.
3. R,M, Atlas and Richard Bartha (2000). Microbial Ecology, Fourth edition, An imprint of Addison Wesley Longman, Inc, New York.

Course Code	Chemistry Practical-V	Course Type	L	T	P	C	CH
B21CH0402		HC	0	0	1.5	1.5	3

Prerequisites:

Theory of conductometry, potentiometry and chemical kinetics.

Course Objectives:

1. Knowledge on different analytical instrumentation techniques for the estimation of analyte.
2. Apply the laboratory skills in quantitative techniques.
3. Understand the importance electrodes in physical related experiments.
4. Compare the involvement various physical properties in experiments.

Course Outcomes:

1. Analyse the importance of instruments while conducting lab experiments.
2. Demonstrate the experimental skills in labs.
3. Operate and interpret experimental data.
4. Identify the causes for unexpected results and to the reach better results.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
	CO1	1	2	1	1	1	1	1			1	2	1	2

B21CH0402	CO2	2	2	1	1	1	2	1			1	2	2	
	CO3	1	2	1	2	1	2	1			1	1	1	1
	CO4	2	1	1	2	1	1	2			1	1	2	

Course Contents:

1. Hydrolysis of methyl Acetate or Ethyl Acetate at Constant temperature.
2. Potentiometric titration of FAS vs $K_2Cr_2O_7$.
3. Conductometric titration of strong acid v/s strong base and acid mixtures v/s strong base.
4. Colorimetric estimation of Cu^{2+} ion using NH_4OH as complexing agent.
5. Determination of percentage composition of sodium chloride solution by determining the miscibility temperature of phenol - water system.
6. pH titration of strong acid against strong base (by observing change in pH).
7. Determination of molecular weight of a polymer material by viscosity measurements (celluloseacetate/methyl acrylate).
8. Colorimetric estimation of Fe^{3+} ion using ammonium thiocyanate as complexing agent.
9. Determination of partition coefficient of acetic acid between n-butanol and water.
10. Verification of freundlich adsorption isotherm of acetic acid on charcoal.
11. Determination of chloride content of water by argentometry.

Reference Books for Practicles

1. B.D. Khosla, V.C. Garg and A. Gulati, Senior Practical Physical Chemistry, R. Chand & Co., New Delhi, 2011.
 2. S.W. Rajbhoj and T.K. Chondhekar, Systematic Experimental Physical Chemistry, Anjali Publication, Second Edition, 2000.
 3. Sunita Rattan, Experiments in Applied Chemistry, S.K. Kataria & Sons, Second edition, 2008.
 4. B.D. Khosla, V.C. Garg, and A. Gulati, Senior Practical Physical Chemistry, R. Chand & Co., New Delhi, 2011.
- C.W. Garland, J.W. Nibler and D.P. Shoemaker, Experiments in Physical Chemistry.

Course Code	Developmental Genetics Lab	Course Type	L	T	P	C	CH
B21GN0402		HC	0	0	1.5	1.5	3

Prerequisites/Pre reading for the course:

1. Students should know the developmental process.
2. They should be capable of Logical thinking.

Course Objectives:

1. To study the developmental pattern of different stages.
2. To understand the involvement of genes in development.
3. To study the potentiality of organ formation.

Course Outcomes:

- After the course, student will be able to
1. Outline the patterns of the development.

2. Co-relate the gene expression and development.
3. Analyse the development of organs from pre-determined mass of cells.
4. Involve in project-based learning.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / OS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GN0402	CO1	3	3			3	2				3	3	2	
	CO2	3	3			3					3	2	2	
	CO3	3	3			3					3	3		
	CO4	3	3	3	3	3	3	3	3	3	3	3	3	3

Course Contents

1. Early embryonic development in Frog0 Egg, cleavage, blastula and gastrula.
2. Genetics of development in Arabidopsis – ABC model Homeotic gene expression (Slide/Chart)
3. Genetics of development in Drosophila 0 Anterior0posterior/dorso0ventral polarity (Slide/Chart)
4. Study of imaginal discs in Drosophila
5. Effect of toxins on development
6. Study of development in Drosophila.
7. Study of developmental disorders.
8. Study of development of chick embryo.

Reference Books:

1. Balansky, Text book of embryology.
2. Developmental biology by Scott.F. Gilbert. Sinauer Associates, Sunderland. 2000.
3. Principles of Development by Lewis Wolpert et al. 5th Edition. oxford University press 2015.
4. Winter, P.C., Hickey, G.I. and Fletcher, H.L. (2002) Genetics, 4th edition, Viva Books
5. Lewin, Benjamin; Krebs, Jocelyn E.; Goldstein, Elliott S.; Kilpatrick, Stephen T. (2014),
6. Genes XI, Jones and Bartlett Learning.
7. Brown, T.A., Chapman and Hall (2011) Genetics a Molecular Approach, 2nd edition, Garland science.
8. Gilbert. (2013) Developmental biology. 10th edition.

FIFTH SEMESTER

Course Code	Microbial Physiology & Technology	Course Type	L	T	P	C	CH
B21MI0501		HC	2	1	0	3	4

Prerequisites/Pre reading for the course:

Students should have basics of microbial metabolism and their various adaptations.

Course Objectives

1. Understand the biochemical mechanism of the basic process in microorganisms.
2. Provide information on the microbial metabolic process.
3. Explore the various techniques for products development obtained from microbes.
4. Explore the various commercially important products from microbial fermentation.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0501	CO1	2	1	1	2		1	1	1	2	3	2	1	2
	CO2	1	2	2	1	1	1	1		2	2	1	1	1
	CO3	1	2	2	1	2	2	1		1	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	3	2	2	2	2

Course Outcomes:

By the end of the course the student will be able to:

1. Understand the microbial metabolic process that can be exploited for allied areas
2. Explore the possible benefits of the microbial anabolic process for environment
3. Understand the various fermentation and their process for commercially useful products
4. Analyse the manufacturing process of commercially important microbial products

Course Contents:

Unit –I Microbial metabolism

12 hrs

Metabolism, anabolism & catabolism, Aerobic and anaerobic respiration-fermentation process, glycolysis, TCA cycle, Entner Duodruffs pathway, pentose phosphate pathway, electron transport chain and energetic at each steps; entry of other carbohydrates and its significance.

Unit- II Microbial photosynthesis

12 hrs

Bacterial photosynthesis (green and purple bacteria)-oxygenic & anoxygenic photosynthesis, role of photosystem and accessory pigments in the photosynthesis, biochemical nitrogen fixation–non-symbiotic and symbiotic bacteria

Unit-III Fermentation technology

12 hrs

Concept of fermentation & Fermentation processes-batch and continuous, plug flow method, Solid state fermentation and liquid fermentation, Fermenter-basic design and types of fermenter, Isolation of industrially important microbial strains, strain improvements & fermentation medium-natural and synthetic medium, different sources, antifoams, precursors and inducers. Various types of fermenters and their design.

Unit-IV Microbial products in industries and its processing

12 hrs

Products of industrial fermentation and downstream processing, outline of the production for ethanol, vinegar, citric acid, amylase, vitamin B, antibiotics (penicillin and streptomycin), brewing and wine making.

References

1. Outlines of Biochemistry Cohn and Stumpf.
2. Microbiology by Dubey & Maheswari
3. Patel A.H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited
4. Glaze A.N. and Nikaido H. (1995). Microbial Biotechnology: Fundamentals of Applied Microbiology. 1st edition. W.H. Freeman and Company.

Course Code	Chemistry –V	Course Type	L	T	P	C	CH
B21CH0501		HC	3	0	0	3	4

Prerequisites:

Knowledge of absorbate and adsorbent, polarity of solvents, basics of polymer.

Course Objectives:

1. To impart basic knowledge about different Chromatographic techniques.
2. To explore polymers and understand the process of synthesis and using for different purposes.
3. To understand the mechanism of rearrangement and named reaction and their importanw.
4. To introduce the basic aspects of spectroscopies such as Molecular spectroscopy (rotational spectroscopy, vibrational spectroscopy, and Raman spectroscopy) and photochemistry.

Course Outcomes:

1. Understand the basic principles and different types of chromatographic techniques and evaluate R_f value.
2. Enhance the understanding of polymerization and their applications.
3. To synthesis and different rearrangement and named reactions
4. Illustrate the basic principles involved in different molecular spectroscopic techniques and give selection rules and brief the laws of photochemistry.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3

B21CH0501	CO1	2	1	1	1			1			2	1	2	
	CO2	3	2	2	1			1			2	2	2	
	CO3	2	1	1	0								2	
	CO4	2	1	1	1			1			1	2	2	

Course Contents:

UNIT-I

12 Hrs

Chromatography:

Introduction, classification of chromatographic techniques.

Paper Chromatography: introduction, Principles, R_f values, experimental procedures, choice of paper and solvent systems, developments of chromatogram - ascending, descending and radial., applications.

Thin layer Chromatography (TLC): Advantages. Principles, factors effecting R_f values. Experimental procedures. Adsorbents and solvents. Preparation of plates. Development of the chromatogram. Detection of the spots, two-dimensional chromatography, Applications.

Column Chromatography: Principles, experimental procedures, Stationary and mobile Phases, Separation technique.

Ion Exchange chromatography-separation of anions and cations,

HPLC: Basic principles, Instrumentation and applications.

UNIT-II

12 Hrs

Polymerisation: Classification, types, addition and condensation polymerisation

Molecular weight of Polymers: Expression for Weight average and Number average (experimental determination is not required), Polydispersity.

Organic and Inorganic Polymers: Inorganic Polymers: structure and applications of silicones, phosphazenes, S-N compounds, S-P compounds, Differences between inorganic and organic polymers.

Organic Polymers: Preparation and applications of the following types of polymers

1. Plastics:

i)thermosetting plastics (Phenol-formaldehyde)

ii) thermo softening plastics (PVC).

2. Fibers: Acrylic, polyamide, polyester types: one example for each.

3. Rubber: Neoprene,

4. Fluoro Carbons: Teflon,

5. Polyaniline, Polythiophene and Orlan.

UNIT-III

12 Hrs

Organic Reaction Mechanism and Synthetic Applications:

Rearrangement reactions: Classification – inter molecular and intra molecular rearrangements- Mechanisms, evidences, migratory aptitude, inter or intra molecular of the following rearrangements: Hofmann, Curtius, Lossen, Beckmann rearrangements, Wolff rearrangement, Pinacol-pinacolone, Favorskii, Benzil-benzilic acid rearrangement, dienone-phenol rearrangement, Cope and Claisen (sigmatropic) rearrangement.

Named Reactions: Simmons-Smith reaction, Reimer-Tiemann reaction, Mannich reaction, Darzens reaction, Chichibabin reaction and McMurry reaction; Baeyer-Villiger reaction. Suzuki and Stille coupling reactions. Oxidation and reduction reactions in organic chemistry.

Reagents: NaBH₄, LiAlH₄, DDQ, DCC, SeO₂, MnO₂, Organocopper reagents in organic synthesis. Functional group inter-conversions and structural problems using chemical reactions.

UNIT-IV

12 Hrs

Molecular spectroscopy: The basis of absorption and emission of radiation by molecular species, the wave properties of the light, the quantum theory of light, quantum theory of matter, molecular energies and the types of molecular motion.

Rotational spectroscopy – Classical description of molecular rotation, quantum mechanics of molecular motion, rotational spectra, rotational energy levels (from Schrodinger equation), selection rules. determination of the bond length from rotational constants,

Vibrational spectroscopy – Quantum description of molecular vibrations, vibrational selection rules, harmonic and a harmonic vibration, vibration of polyatomic molecules.

Raman Spectroscopy – description of Raman scattering, Rayleigh scattering, Stokes and anti-Stokes's scattering, polarizability of the molecules, rotational Raman spectra, Comparision of Raman and IR.

Reference Books:

1. P. W. Atkins – Physical Chemistry, eighth Edition, New York, 2006,
2. P.W. Atkins, and J.D. Paula, Physical Chemistry for the Life Sciences, New York, 2011
3. P.J. Larkin, IR and Raman Spectroscopy, Principles and Spectral Interpretation, Elsevier, 2011.
4. S.M. Khopkar, Basic concepts of Analytical Chemistry. New Age International
5. Madan, Malik and Tuli, Selected Topics in Inorganic Chemistry, S. Chand & Company.
6. B.K. Sharma, Instrumental methods of Chemical analysis, Goel Publishing House.
7. Willard, Meritind and Dean, Analytical Chemistry, New Age Publications.
8. H.H. Willard, L.L. Merrite, K.A. Dean and F.A. Kettle, Instrumental methods of Chemical analysis CBS Publishers.
9. C.N. Banwell, Fundamentals of Molecular Spectroscopy.
10. W.A. Gullory, Introduction to Molecular Structure and Spectroscopy.
11. R Chang, Basic Principles of Spectroscopy.
12. M. Kundan and S.K. Jain, Physical Chemistry, S. Chand & Company.
13. K.K. Sharma and C.K. Sharma, Text book of Physical Chemistry, Vani Educational Books.

Course Code	Human Genetics	Course Type	L	T	P	C	CH
B21GN0501		HC	2	1	0	3	4

Prerequisites/Pre reading for the course:

1. Students should have basics of genetics knowledge.
2. They should have knowledge of morphology of chromosomes.

Course Objectives

The objective of this Course is:

1. To know the history of human genetics.
2. To employ the techniques such as karyotyping, FACS, genetic counselling.
3. To outline the inheritance pattern of genetic disorders.
4. To familiarize the diagnostic techniques used in medical and forensic fields.

Course Outcomes:

After completing the course, the student should be able to:

1. Outline the different patterns of inheritance of allosomes and autosomes.
2. Analyze the aberrations by karyotypes and Flow cytometry.
3. Interpret the inheritance by analysing pedigree tree.
4. Familiarize with the prenatal diagnosis, genetic counseling and dermatoglyphics.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GN0501	CO1	3	3	3			3	3	3		3	3	2	3
	CO2	3	3	3	3		3	3	3		3	3	2	3
	CO3	3	3	3			2	2	2		3	3	2	3
	CO4	3	3	3	3	3	3	3	2	2	3	3	2	3

Course Contents:

UNIT- I

12 Hrs

History of Human Genetics.

Paris Nomenclature, Flow karyotyping (Quantification of DNA of individual chromosomes)

FACS-Fluorescence Activated Cell Sorter.

Human chromosomes and karyotyping: G-banding, nomenclature of banding

Nomenclature of aberrant karyotypes

Common syndromes due to numerical chromosome changes

Common syndromes due to structural alterations (translocations, duplications, deletions, microdeletion, fragile sites)

UNIT- II

12 Hrs

Genetic Diseases and Inheritance Pattern: Autosomal inheritance- Dominant (Ex. Adult polycystic kidney, Achondroplasia and Neurofibromatosis) Autosomal inheritance- Recessive (Ex. Albinism, Sickle cell anaemia, Phenylketonuria) X-linked – Recessive: (Ex. Duchenne muscular dystrophy-DMD) X-linked- Dominant: (Ex. Xg blood group) Y-linked inheritance: Holandric gene (Ex. Testes determining factor - TDF) Multifactorial inheritance: (Ex. Congenital malformations: Cleft lip and palate, Rheumatoid arthritis and Diabetes) Mitochondrial diseases: (Ex. Leber's hereditary optic neuropathy)

UNIT-III**12 Hrs**

Pedigree studies and Genetic Counselling: Symbols used in pedigree studies, Pedigree analysis and construction, Pedigree analysis for the inheritance pattern of genetic diseases, Genetic Counselling.

Stage 1: History and pedigree construction

Stage 2: Examination

Stage 3: Diagnosis

Stage 4: Counselling

Stage 5: Follow up.

Problems and case studies.

UNIT-IV**12 Hrs**

- a. Dermatoglyphics: Introduction and Patterns. Dermatoglyphics in clinical disorders- Down's syndrome, Turner's syndrome, Klinefelter's syndrome and Cri du chat syndrome. Clinical applications, Advantages and Limitations.
- b. Prenatal Diagnosis: Introduction and types Invasive Prenatal diagnosis - Amniocentesis, Chorionic villus sampling. Non – Invasive Prenatal diagnosis – Ultrasonography.
- c. Genetics and Society: Eugenics: Positive and negative, Euthenics, Euphenics Human genome project – introduction and significance Gene therapy with reference to SCID Stem cells- Properties, types and sources. A brief account on Cord blood banking and Stem cell therapy.

Reference Books:

1. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) a Rastogi Publications, Meerut.
2. Emery's Elements of Medical Genetics- Peter Turnpenny, SlanEllard 15th Edition. 2017.
3. Essentials of Human Genetics by S.M. Bhatnagaretal (1999) IV edition. Orient Longman.
4. Genetic basis of common diseases by R. A. King et al, Oxford University Press 2002.
5. Genetics in Medicine by M.W. Thompson et al, 5 Edition, W.B. Saunders Company, London 1996.
6. Human Cytogenetics. Denise Rooney Oxford University Press, 2001.
7. Human Genetics – Bruce.R. Korf. 2000
8. Human Genetics: Concepts and Applications by Lewis R (2001) McGrawHi; Boston.
9. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt. Ltd., New Delhi.
10. Medical Genetics. Lynn Jorde John CareyMichaelBamshad. 2015.
11. Mendelian inheritance in Man by-Mc. Kusick V.A, (1998), 12 Edition, John Hopsins University Press.
12. Molecular Basis of Inherited Diseases, (6th Edition-1989) by Scriver, C.R. A.L. Beudit, W.S. Styabnd D. Valle (EdsOMcGrawHill, New York.

Course Code	Medical Genetics	Course Type	L	T	P	C	CH
B21GNS511		SC	2	1	0	3	4

Prerequisites/Pre reading for the course:

1. Students should have basics of genetics knowledge about pathology.
2. They should have knowledge of cancer biology.

Course Objectives:

The Objective of this Course is:

5. To teach the basics of medical genetics and learn the patterns of heredity
6. To categorize the genetic disorders.
7. To explore the molecular therapeutics for disease management
8. To understand the mechanism of carcinogenesis.

Course Outcomes:

After completing the course, the student should be able to:

1. Predict the patterns of heredity.
2. Analyze the molecular reason of genetic disorders and therapeutic methods.
3. Illustrate the process involved in recombinant protein production.
4. Understand the characteristics and categories of cancer

Mapping of Course Outcomes with programme Outcomes

Course Code	POS COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PS01	PS0 2	PS0 3
B21GNS511	CO1	3	3	3			3		3		3	3	2	
	CO2	3	3	3			3		3		3	3	3	2
	CO3	3	3	3	3		2				3	3	3	3
	CO4	3	3	3	3		3		3		3	3	3	

Course Contents:

UNIT-I Genetics in medical Practice

12 Hrs

Genetic Principles and their application in medical practice, Case studies (Interacting with patients, learning family history and drawing pedigree chart), Syndromes and disorders: Definition and their genetic basis. Genetics of diseases due to inborn errors of metabolism: Phenylketonuria, galactosemia.

UNIT-II Human Genetic Disorders of Nervous system and Eye

12 Hrs

Neurogenetic disorders - Charcot-Marie tooth syndrome, Spino-muscular atrophy, Alzheimer's disease & Syndromes due to triplet repeat expansion, Parkinson's disease, Prion diseases, Colour Blindness, Retinitis pigmentosa, Glaucoma & Cataracts.

UNIT-III

12 Hrs

Oncogenetics: A brief account of cancer-definition, types-Benign and Malignant; Sarcoma, Carcinoma, Lymphoma and Leukaemia Properties of malignant cells.

Types of genes - Proto oncogenes, Oncogenes, Difference between V- and C oncogenes, Tumor

Suppressor genes-p53, pRb.

Chromosomal abnormalities associated with the specific malignancies- Acute Promyelocytic Leukaemia (APL), Chronic Myeloid Leukaemia (CML) and Acute lymphoblastic leukaemia (ALL)

UNIT-IV

12 Hrs

Patterns of Single Gene Inheritance: Haematopoietic systems-Sickle cell Anemia, Thalassemias and Haemophilias, Muscle genetic Disorders-Duchenne Muscular Dystrophy, Becker Muscular Dystrophy, Cystic Fibrosis, Tay Sach's Syndrome & Marfan syndrome.

Gene therapy, molecular therapeutics, Production of recombinant insulin, interferon and human growth hormone (HGH) Vaccines: Hepatitis B vaccine Preparation of molecular probes, Monoclonal antibodies and diagnostic kits, Microarray

Reference Books:

1. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt. Ltd., New Delhi.
2. Medical Genetics. Lynn Jorde John CareyMichaelBamshad. 2015.
3. Mendelian inheritance in Man by-Mc. Kusick V.A, (1998), 12 Edition, John Hopsins University Press.
4. Molecular Basis of Inherited Diseases, (6th Edition-1989) by Scriver, C.R. A.L. Beudit, W.S. Styabnd D. Valle (EdsOMcGrawHill, New York.

Course Code	Applicative Genetics	Course Type	L	T	P	C	CH
B21GNS512		SC	2	1	0	3	4

Prerequisites/Pre reading for the course:

1. Students should have basics of Recombinat DNA technology.
2. They should have knowledge about sequencing.

Course Objectives:

The Objectives of this course is to:

1. To understand the process of recombinant DNA technology and its applications.
2. To learn the methodology of DNA fingerprinting and its applications.
3. To explore the world of genomics and proteomics.\
4. To study the basics of bioinformatics.

Course Outcomes:

After completing the course, the student should be able to:

1. Outline the process involved in the production of molecular therapeutics.
2. Design the sequencing process and analyse the data.
3. Align the sequences and interpret them in constructing phylogeny.
4. Apply the knowledge of genetics in pharmacogenomics and transgenic technology.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PS01	PS02	PSO 3
B21GNS12	CO1	3	0	3					3		3	3	3	
	CO2	3	3	3	3	2	2				3	3	3	
	CO3	3	3	3	3	3	3		3		3	3	3	
	CO4	3	3	3	3	3	3				3	3	3	

Course Contents:

UNIT-I CRYOBIOLOGY: CRYOGENETICS

12 Hrs

Cryogenetics: Stem cell bank, cell bank, gene bank, cDNA library, embryo bank, sperm bank, pollen bank,

DNA fingerprinting and Methodology

Molecular markers –RAPD, RFLP, Microsatellite, SNPs, STR

UNIT-II Genomics and Proteomics

12 Hrs

Genomics:

Structural and functional genomics. Whole genome sequencing – Maxam-Gilbert sequencing, Sanger sequencing, Pyrosequencing, Next generation sequencing.

Protein engineering and proteome analysis:

Insertional and deletion mutagenesis, Site directed mutagenesis, Proteome analysis, Protein arrays and their applications.

UNIT-III Bioinformatics

12 Hrs

Biological databases: Overview, modes of database search, mode of data storage (Flat file format, db0tables), flat0file formats of GenBank, EMBL, DDBJ, PDB.

Sequence alignment:

Concept of local and global sequence alignment, pairwise sequence alignment, scoring an alignment, substitutional matrices, multiple sequence alignment.

Phylogenetic analysis:

Basic concept of phylogenetic analysis, rooted/unrooted trees, approaches for phylogenetic tree construction (UPGMA, Neighbor joining, Maximum parsimony, Maximum likelihood).

UNIT-IV Applicative Genetics

12 Hrs

Transgenic plants and animal: Creating transgenic animals and plants. Plant tissue culture. Animal cloning. Restriction and regulation for the release of GMOs into environment. Ethical, legal, social and environmental Issues related to rDNA Technology. Biosafety and Bioethics.

Pharmacogenetics: History, Early evidence; Clinical determinants; Molecular insights (genes involved in pharmacokinetics and pharmacodynamics of drugs); Applications in pre-prescription testing. Pharmacogenomics, Clinical trials.

Reference Books:

1. Gene cloning and DNA analysis, T.A. Brown (2010) 6th edition, Wiley-Blackwell publication
2. Human Molecular Genetics, Peter Sudbery (2002) 2nd Edition, Prentice Hall
3. Human Molecular Genetics, Tom Strachen and Andrew P. Read (1999) 2nd edition, John Wile and sons.
4. Molecular Biotechnology, Principles and application of recombinant DNA Glick and Pasternak. 2010.
5. Introduction to bioinformatics Arthur M Lesk

Course Code	Microbial Physiology and Technology Lab	Course Type	L	T	P	C	CH
B21MI0502		HC	0	0	1.5	1.5	3

Prerequisites/Pre reading for the course:

Students should have basics of microbial metabolic activities and their biochemical tests

Course Objectives:

1. Practical handling to isolate the microorganisms for industrial importance's.
2. Analyse the microbial metabolic processes involved commercially important products.
3. Perform the individual experiments related to microbial process.
4. Explore the microorganisms for the sustainable environmental conditions.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0502	CO1	2	1	1	2	1		1	1	1	3	2	1	1
	CO2	1	2	2	1	1	1	1		2	2	1	1	1
	CO3	1	2	2	1		2	1		1	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	2	2	2	2	2

Course Outcomes:

By the end of the course the student will be able to:

1. Perform the enumeration and isolation of commercially important microorganisms
2. Produce the microbial enzymes and estimate its activity
3. Analyse microbial metabolites and their significance
4. Test and estimate the commercially important microbial products

Course Contents:

1. Isolation and enumeration of Microbes from starch degraders
2. Production of amylase and cellulases from microbes

3. Staining of root nodules from legumes
4. Methylene blue reduction tests of milk Samples
5. Production of wine
6. Estimation of Lactic acid in microbial products
7. Microbial production of Citric acid & its estimation
8. Antibiotics production & AST

References

1. Patel A.H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited
2. Glaze A.N. and Nikaido H. (1995). Microbial Biotechnology: Fundamentals of Applied Microbiology. 1st edition. W.H. Freeman and Company.

Course Code	Chemistry Practical-V	Course Type	L	T	P	C	CH
B21CH0502		HC	0	0	1.5	1.5	3

Prerequisites:

Knowledge of principles of gravimetry and paper chromatography.

Course Objectives:

1. Intended to impart analytical skills with an emphasis on application oriented quantitative analysis such as gravimetric and chromatographic separation.
2. Define and understand the concept of gravimetric analysis.
3. Able to use different instrument to validate the theoretical concepts with experimental results.
4. Expertise in using the conductometry, colorometry, Abbe's reflectometry and perform the experiments to measure the physical and chemical properties.

Course Outcomes:

1. Interpret different gravimetric analysis methods.
2. Acquire training in the quantitative analysis of metal ions and anions using gravimetric method.
3. Develop skills in handling the conductometry, colorometry, Abbe's reflectometry instruments.
4. Compute the result of analysis and to document its reliability.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0502	CO1	1	2	2	1			2				3	1	2
	CO2	1	2	1	3			3				3	1	1
	CO3	1	2	2	2			2				3	1	1
	CO4	1	1	2	1			2			2	3	1	2

Course Contents:

1. Gravimetric estimation of barium as barium sulphate.
2. Gravimetric estimation of copper as copper (I) thiocyanate.
3. Gravimetric estimation of nickel as nickel dimethylglyoximate.
4. Gravimetric estimation of zinc as zinc oxide.
5. Paper chromatographic separation of Fe^{3+} and Ni^{2+} ions.
6. Determination of solubility of sparingly soluble salt (like BaSO_4) by conductometric method.
7. Determination of K_a (dissociation constant of a weak acid) by conductometric method.
8. Determination of rate constant of saponification of ethyl acetate by conductivity measurements.
9. Determination of percentage composition of a given mixture containing two miscible liquids by Abbe's refractometer (Demo).
10. Colorimetric study of kinetics of oxidation of indigocarmine by chloramine-T.
11. Preparation of standard potassium dichromate solution and estimation of iron in the given sample of hematite by dichromate method.
12. Estimation of copper in bronze by iodometric method.

Reference Books

1. A.I. Vogel, A Textbook Quantitative analysis, ELBS.
2. B.K. Sharma, Instrumental methods of Chemical analysis, Goel Publishing House.
3. Gurudeep Raj, Advanced Practical Inorganic Chemistry, Goel Publishing House.
4. M.A. Malati, Experimental Inorganic/Physical Chemistry, Horward Series in Chemical science.

Course Code	Human Genetics Lab	Course Type	L	T	P	C	CH
B21GN0502		HC	0	0	1.5	1.5	3

Prerequisites/Pre reading for the course:

1. Students should have basics of genetics knowledge.
2. They should have knowledge of morphology of chromosomes.

Course Objectives:

The Objectives of this course is to:

1. To study different banding techniques and karyotypes
2. To understand the concept of dosage compensation in different cells.
3. To analyse the count of blood cells
4. To construct the pedigree and record the fingerprints.

Course Outcomes:

After completing the course, the student should be able to:

1. Analyse the karyotypes and interpret the disorder.

2. Visualize Barr body in epithelial cells and drumsticks in neutrophils.
3. Diagnose genetic diseases.
4. Compare the fingerprints in forensic investigation.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GN0502	CO1	3	3	3			3	0			3	3	3	3
	CO2	3	3	3	3		3	3			3	3	3	
	CO3	3	3	3	3		3				3	3	2	3
	CO4	3	3	3	3		3	3	3		3	3	3	3

Course Contents:

1. Study of Karyotypes I: Normal Karyotyping in Human 1Prc. Male (46, XY) Female (46, XX).
2. Study of Karyotypes II: Abnormal Karyotypes 1 Prc. Down's syndrome (autosomal). Turner's syndrome (sex chromosomal), Klinefelter's syndrome (sex chromosomal)
3. Study of banding techniques (G-banding technique).
4. Study of drum sticks in Neutrophils of Blood smear.
5. Blood Cell counting using Haemocytometer (RBC and WBC).
6. Pedigree analysis and construction: Symbols used and problems associated with autosomal recessive disorder, autosomal dominant disorder, Sex linked inheritance (X and Y)
7. Dermatoglyphics: Recording of print of fingertips and palm. Classifying ridges on the Finger tips: arch, loop, and whorl. Palm print - area demark as hypothenar, thenar and inter - digital areas, Recording presence or absence of Simian crease. Ridge Counting and angle calculation.

Reference Books:

1. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) a Rastogi Publications, Meerut.
2. Emery's Elements of Medical Genetics- Peter Turnpenny, SlanEllard 15th Edition. 2017.
3. Essentials of Human Genetics by S.M. Bhatnagaretal (1999) IV edition. Orient Longman.
4. Genetic basis of common diseases by R. A. King et al, Oxford University Press 2002.
5. Genetics in Medicine by M.W. Thompson et al, 5 Edition, W.B. Saunders Company, London 1996.
6. Human Cytogenetics. Denise Rooney Oxford University Press, 2001.
7. Human Genetics – Bruce.R. Korf. 2000
8. Human Genetics: Concepts and Applications by Lewis R (2001) McGrawHi; Boston.
9. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt. Ltd., New Delhi.
10. Medical Genetics. Lynn Jorde John CareyMichaelBamshad. 2015.

11. Mendelian inheritance in Man by-Mc. Kusick V.A, (1998), 12 Edition, John Hopsins University Press.
12. Molecular Basis of Inherited Diseases, (6th Edition-1989) by Scriver, C.R. A.L. Beudit, W.S. Styabnd D. Valle (EdsOMcGrawHill, New York.

SIXTH SEMESTER

Course Code	Agriculture Microbiology	Course Type	L	T	P	C	CH
B21MI0601		HC	2	1	0	3	4

Prerequisites/Pre reading for the course:

Students should have the knowledge of use of microbes in the agriculture

Course Objectives:

1. Explore the role of microorganisms and their application in agriculture.
2. Inculcate the beneficial aspects of microorganisms for sustainable agriculture.
3. Utilisation of microorganisms and its important role in sustainable environment.
4. To acquire the knowledge of environmental pollution sources, effect and control measure using microorganisms.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0601	CO1	2	1	1	2	3	1	1	1		3	2	1	1
	CO2	1	2	2	1	2	2	1		1	2	1	1	1
	CO3	1	2	2	1	1	1	1		2	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	1	2	2	2	3

Course Outcomes:

By the end of the course the student will be able to:

1. Analyse agricultural microorganisms and their beneficial and deleterious aspects
2. Utilisation of various microbes for sustainable soil fertility and crop development
3. Analyse the environmental issues, conditions and their deleterious effects
4. Designing for better bioremediation and waste management strategies.

Course Contents:

Unit-I Soil Microbiology

12 hrs

Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation- symbiotic, associative and a symbiotic. Azolla, blue green

algae and mycorrhiza. Rhizosphere and phyllo sphere. Plant diseases causing Microbes, Bacterial Blight, Powdery mildew. Mosaic Virus.

Unit -II Microbes for Sustainable Agriculture

12 hrs

Silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste. Definition of biotransformation, Biotransformation process, Biotransformation in plant cells via Agrobacterium mediated gene transfer. Applications of Biotransformation.

Unit-III Phytopathogens and its control

12 hrs

Importance and history, definitions and concepts of plant diseases, Classification of Plant Diseases. Phytopathology – Classification of plant diseases, signs, and related terminology. Bacterial disease – Citrus canker, Blight of paddy, Fungal Disease- Red rot of sugarcane, Black stem rust of wheat, Tikka leaf spot, Wilt of cotton, Viral Disease – TMV, Vein clearing disease. Principles and methods of plant disease management, integrated plant disease management

Unit-4 Microbial Interaction in the environment

12 hrs

Interaction between soil microbes–Neutralism, Commensalism, Symbiosis, Synergism, Amensalism, Parasitism, Predation and Competition. Interrelationships between soil microbes and plants, Rhizosphere concept, R:S ratio, rhizoplane; spermosphere; phyllosphere, Mycorrhizae-types, Rumen flora, Insects microbial interactions.

References

1. Subba Rao NS (2004). Soil Microbiology. Fourth edition, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Mishra RR (2004). Soil Microbiology. First edition, CBS Publishers and distributors, New Delhi.
3. Rangaswami G and Mahadevan A (2002). Disease of Crop Plants in India. Fourth edition, PHI Learning (P) Ltd., New Delhi.
4. Rangaswami G and Bagyaraj DJ (2002). Agricultural Microbiology. Second edition, PHI Learning (P) Ltd., New Delhi.
5. Robert, L Tate (1995). Soil Microbiology. First edition, John Wiley and Sons, Inc. New York.
6. R,M, Atlas and Richard Bartha (2000). Microbial Ecology, Fourth edition, An imprint of Addison Wesley Longman, Inc, New York.

Course Code	Chemistry-VI	Course Type	L	T	P	C	CH
B21CH0601		HC	3	0	0	3	4

Prerequisites:

Basic Knowledge of ligand, types of chemical bonding, periodic table, pi bond and sigma bond, laws of photochemistry.

Course Objectives:

1. To give students a firm grounding in Co-ordination chemistry.
2. To impart knowledge about radioactivity and nuclear chemistry.
3. To introduce the photochemistry, important photochemical process in our lives and understand the different photochemical reactions. Also introduce the solidstate chemistry and importance X-ray diffraction to understand the crystalline materials structure.
4. To impart knowledge about different spectroscopic techniques.

Course Outcomes:

1. Understand the fundamentals of coordination chemistry, Isomerism and M-L bonding in transition metal complexes.
2. Acquire the knowledge about different nuclear energy resources, radioactivity and nuclear chemistry.
3. Appreciate the natural photochemical reactions, drive towards the usage of natural energy resource and to be analyse structure of crystalline solids with the help of XRD.
4. Analyse the different organic compounds using the UV-vis, IR and NMR spectroscopy and to elucidate their structures.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0601	CO1	2	2	2	1		1				1		1	
	CO2	3	2	1	1						2	1	1	
	CO3	2	1	2	2		1				2	2	1	
	CO4	2	3	1	2		1	1			2	1	1	

Course Contents:

UNIT-I

12hrs

Coordination and Organometallic compounds:

Coordination compounds, ligands and their classification (mono, bi, tri, tetra, penta and hexa dentate ligands) and ambidentate ligands, coordination number, nomenclature of coordination compounds in detail. Theories of structure and bonding (Explanation for the formation of complexes by Werner's Theory in detail and its limitations). EAN rule, Valence bond theory postulates, low spin and high spin complexes with examples, limitations of VBT. Crystal field theory (octahedral, tetrahedral and square planar complexes). Crystal field splitting and crystal field stabilization energies, limitations of CFT. Magnetic properties of $[\text{CoF}_6]^{3-}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Fe}(\text{CN})_6]^{4-}$, $[\text{Fe}(\text{CN})_6]^{3-}$. Spectral properties of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$, $[\text{CoCl}_4]^{2-}$.

Isomerism-Structural: ionization, linkage, hydrate and coordination isomerism with examples. Stereoisomerism-geometrical and optical isomerism (CN: 4 & 6) with examples.

Organometallic compounds– ligands, classification (hapticity). Synthesis and structure of $\text{K}[\text{PtCl}_3(\eta^2\text{-C}_2\text{H}_4)]$ and $[\text{Fe}(\eta^5\text{-C}_5\text{H}_5)_2]$.

UNIT-II

12Hrs

Nuclear Chemistry: Introduction to Nuclear forces (brief explanation), nuclear stability-n/p ratio, Mass defect, Binding energy, Inner structure of nucleus- Liquid drop model, Nuclear fission- (definition with suitable examples), Calculation of energy release in nuclear fission, modes of release of fission energy (uncontrolled and controlled).

Plutonium as a fissionable material (Plutonium bomb), nuclear fusion and its advantages over nuclear fission reactions, hydrogen bomb, nuclear transmutation-artificial radioactivity. Detection and measurement of radioactivity – G. M. counter. Cyclotron, Nuclear reactor, Breeder reactor, Q values of nuclear reactions.

Uses of radio isotopes – tracer technique, agriculture, medicine, food preservation and carbon-14-dating (explanation). Separation of uranium isotopes – Laser irradiation method (atomic and molecular routes). Nuclear programme in India.

UNIT-III

12Hrs

Laws of Photochemistry: Grotthus-Draper law, Stark-Einstein law, Differences between photophysical and photochemical processes with examples. Comparison of photochemical and thermal reactions. Quantum yield of photochemical combination of (1) $\text{H}_2 - \text{Cl}_2$ (2) $\text{H}_2 - \text{Br}_2$, (3) dissociation of HI (4) dimerisation of anthracene. Photochemistry: Primary and secondary processes in photochemical reactions. Photoelectric cells.

Basics of Crystallography: Classification of solids, CCP, HCP, Packing fraction, voids etc, Laws of crystallography – (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements of crystals. Definition of unit cell & space lattice. Bravais lattices, crystal system. X-ray diffraction by crystals. Derivation of Bragg equation and its application in the determination of crystal structure of NaCl by rotating crystal method (Numericals).

UNIT-IV

12Hrs

Spectroscopy of Organic compounds

UV-Visible spectroscopy: Introduction to spectroscopy, Absorptions laws, types of electronic transitions. Chromophores and auxochromes, blue shift and red shift. Conjugation and solvent effects. UV-visible spectra of some organic compounds (naphthalene, anthracene and beta-carotene).

IR spectroscopy: Introduction, principle, theory of molecular vibrations, number of fundamental vibrations, factors influencing vibrational frequencies. Stretching frequency of –OH (free and H-bonded), alkyl –C-H, –C=C-H, C=C, C-C, C=O and C-O groups (by taking suitable examples). IR spectra of some organic compounds.

NMR Spectroscopy: Basic principles, quantum approach- Magnetic nature of electron and nucleons, basic NMR equation. Equivalent and non-equivalent protons. Chemical shift. TMS as reference, Spectra of simple organic molecules ethanol, ethyl bromide, acetaldehyde, and toluene. Qualitative Organic Analysis: Identification of functional groups by chemical tests; elementary UV, IR and ^1H NMR spectroscopic techniques as tools for structural elucidation.

Reference Books:

1. Puri, Sharma & Kalia Shobhanlal Nagin, Principles of Inorganic Chemistry, Chand Co.
2. Gurudeep Raj, A Textbook of Inorganic Chemistry.
3. J.D. Lee, Concise Inorganic Chemistry B-Block Well Science Ltd.
4. Sathya Prakash, A Textbook of Inorganic Chemistry

5. D.L. Pavia, G.M. Lampman, G.A. Kriz and J.R. Vyvyan, Introduction to Spectroscopy, Cengage Learning, 5th edition, 2015.
6. M.K. Jain, A Textbook of Organic Chemistry, S. Chand & Company.
7. Bhal & Bhal, A Textbook of Organic Chemistry, S. Chand & Company.
8. V.K. Ahluwalia & Renu Aggarwal, Organic Synthesis special techniques, Narosa publishing.

Course Code	Evolutionary & Biometrical Genetics	Course Type	L	T	P	C	CH
B21GN0601		HC	2	1	0	3	4

Prerequisites/Pre reading for the course:

1. Students should have the knowledge of theories of evolution.
2. Students should be aware Basic mathematical concepts.

Course Objectives:

The Objectives of this course is to:

5. To explain the concept of population genetics and its application in studying the evolution of the species.
6. To discuss the inheritance involving quantitative characters.
7. To study the basics of statistics and its applications.
8. To apply the knowledge of biometry in genetic variation.

Course Outcomes:

After completing the course, the student should be able to:

1. Characterize the genetic variations observed in population.
2. Explore the mechanism of transposition.
3. Discuss the inheritance of quantitative characters.
4. Apply the knowledge of biometry in the phenotypic variation of traits.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GN0601	CO1	3	3	3		3	2	2			3	3	2	
	CO2	3	3	2							3	3	2	
	CO3	3	3	3		3	2				3	3	2	
	CO4	3	3	3	3	3	2					3	2	

Course Contents:

UNIT-I

12 hrs

Darwinism, Neo Darwinism and Synthetic Theory.

Population genetics: Gene pool, Gene and genotype frequencies: Hardy-Weinberg principle,

Evolutionary agents: Selection – differential selection, gametic selection, zygotic selection, fitness;

Migration; Mutation and Random drift.

Speciation: Methods of speciation, - Isolating Mechanisms-Pre-mating and Post mating. Evolution at molecular level: - Nucleotide sequence.

Transposable elements: Bacteria, Yeast, Maize and *Drosophila*, humans.

UNIT-II

12 hrs

Quantitative Characters and Inheritance:

Quantitative Characters: -Types- Continuous, meristic and threshold characters with examples.

Quantitative inheritance: -Features of polygenic traits in relation to oligogenic traits. Inheritance of Kernel color in wheat and Skin colour in human.

Transgressive inheritance in Poultry.

Environmental effects–IQ in Humans

Significance of polygenic inheritance-Twin study

UNIT-III

12 hrs

Elements of Biometry

Measures of Central Tendency – Mean, Median and Mode

Measures of Dispersion – Variance and Standard deviation

Test of Hypothesis – Student's 't' Test, Chi square Test.

Probability – Definition and rules.

Distribution – Normal, Binomial and Poisson.

UNIT-IV

12 hrs

Biometrical Genetics:

An introduction to Correlation, Regression and ANOVA (Analysis of Variance)

Genetic analysis of quantitative trait: - Ear length in Corn

Variances in polygenic traits: - Phenotypic, genotypic, environmental, additive, dominance and Epistatic variance; Genotype and environmental interaction.

Heritability: - Broad sense and Narrow sense heritability, Quantitative trait loci (QTL). Problems related to Variance and Heritability.

Reference Books:

1. Evolution –Stickberger, M. W (1990) Jones and Bartlett, Boston.
2. Evolutionary Genetics by Maynard Smith J (1989), Oxford University press.
3. Genetics and Analysis of Quantitative traits by Lynch. M and B. Walsh (1997). Senauer Associates, Sunderland.
4. Introduction to Quantitative Genetics by Falconer, D (1995) 4th edition Longman, London.
5. Population Genetics and Quantitative Genetics by Mari selvi K. Kalyani Publications. 2008.

Course Code	Chemistry of Bio Molecules	Course Type	L	T	P	C	CH
B21CHS611		SC	3	0	0	3	4

Prerequisites:

Amino acids, proteins, peptides, carbohydrates, lipids etc.,

Course Objectives:

1. Understand the significance of biomolecules in various biological functions.
2. Develop the knowledge on various methods to synthesis amino acids from available starting materials.
3. Explain the structure and functions of various biomolecules such as nucleic acids, enzymes and vitamins.
4. Discuss the role of amino acids, proteins and peptides in living system.

Course Outcomes:

1. Classify the different type of biomolecules, explain their structure and functions.
2. Predict the role of biomolecules in various biochemical mechanisms.
3. Outline the significance of amino acids, enzymes, lipids, nucleic acids and carbohydrates.
4. Build the importance of essential and trace elements in the biological processes.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CHS611	CO1	3	2	2	1		2				1	2	3	2
	CO2	3	2	2	2		1	1				2	3	3
	CO3	2	3	2	1						2	2	3	2
	CO4	2	3	2	2			1			1	3	3	2

Course Contents:

UNIT-I

12 hrs

Introduction to Biomolecule.

Carbohydrates:

Introduction and definition, Types of naturally occurring sugars. Deoxy sugars, amino sugars, branched chain sugars, methyl ethers and acid derivatives of sugars. Structure, degradation and biological functions of starch, cellulose and chitin.

Lipids:

Introduction, isolation and properties of lipids. Oils and fats: definitions and significances of hydrogenation, iodine value, saponification value and auto-oxidation of oils and fats. Phospholipids:

lecithins, cephalins and phosphatidyl serine. Sphingolipids: sphingosine, sphingomyelin and cerebrocides.

UNIT-II

12 Hrs

Drugs: Chemotherapy and chemotherapeutic agents, definition of drugs, types of drugs, antipyretics, analgesics, anesthetics, sedatives, narcotics, antiseptics, antibacterials, antibiotics, antimalarials and sulpha drugs with examples. Synthesis of paracetamol, sulphanilamide, sulphaguanidine, Insecticides, Pesticides.

UNIT-III

12 hrs

Enzymes and Vitamins

Enzymes

Characteristic features, classification (EC code number not required) active site, specificity, Fisher and Koshland models. Enzyme kinetics-factors affecting rate of enzymatic reactions, Michaelis-Menten equation (derivation not required). Competitive and non-competitive inhibition. Cofactors.

Vitamins

Definition, classification and deficiency manifestation of water soluble and fat-soluble vitamins. Coenzyme functions of B complex vitamins.

UNIT-IV

Amino acid, peptide and proteins

12 hrs

Essential and non-essential amino acids, amino acids building blocks of proteins, classification, structure and properties of amino acids, peptide bonds. Biologically important peptides, Protein-primary, secondary, tertiary and quaternary structures. Outline of various biological functions of proteins, Basic techniques in protein chemistry.

Reference Books:

1. J.D. Rawn, Biochemistry, Neil Pattison publishers, North Carolina, USA, 1989.
2. I.L. Finar, Organic Chemistry, Vol I and Vol II, 6th edn. ELBS & Longman, London, 1975.
3. D. Chapman, Introduction to Lipids, McGraw-Hill, 1969.
4. S.K. Ghosh, Advanced general Organic Chemistry, DK and Allied publishers (UBS), Calcutta, 1998.
5. E.S. West, W.R. Todd, H.S. Mason & J.T. Van Bugen, Text book of Biochemistry, 4th Edn. Amerind publishing co., New Delhi, 1974.
6. Ashutosh Kar, Medicinal Chemistry, Tata McGraw Hill Publications.

Course Code	Electro-Analytical Chemistry	Course Type	L	T	P	C	CH
B21CHS612		SC	3	0	0	3	4

Prerequisites:

Basic knowledge of electrochemistry, cells, batteries, corrosion, electrodes, anode, cathode, electrochemical series, standard hydrogen electrode potential, EMF.

Course Objectives:

1. Explain the fundamental concept, principles and laws of electrochemistry,

2. Discuss related to the types of electrodes and study of electrode reactions pathway.
3. Classify the types of corrosion and its controls.
4. Describe the concept of electrochemical sensor, electrochemical energy storage and conversion devices.

Course Outcomes:

1. Analyze the basic concepts of electroanalytical techniques.
2. Classify the types of electrochemical reaction and its mechanism.
3. Apply the knowledge of corrosion science and its control essential for the commercially available materials.
4. Design the electrode with suitable materials for various application in the field of electrochemical sensors, electrochemical energy storage and conversion devices.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CHS612	CO1	1		1	1						1	3	1	3
	CO2	1	2	2	1							1	1	2
	CO3	1		2	1						3	2	1	2
	CO4	1		1	2						2	3	3	1

Course Contents:

UNIT-I 12 Hrs

Basic electro chemistry: Electrochemistry Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential. Electrochemical series.

Polarography: Definition, advantage of dropping mercury electrode, factors affecting on limiting current, Half wave potentials and significance, Ilkovic equations, Applications of Polarography

Amperometric Titrations: Basic principle involved in the Amperometry, Amperometric Titrations and applications, Advantages and disadvantages of Amperometric Titrations.

UNIT-II 12 Hrs

Electro analytical methods: Potentiometry, Conductometry, Colorimetry, cyclic voltammetry and pulse voltammetry.

Electrochemical sensors: Potentiometric Sensors and voltammetric sensors, Non-enzymatic Sensors for determination of-Amino Acids, Glucose, hydrogen peroxide and urea.

UNIT-III 12 Hrs

Electro Chemical Energy Storage and Conversion Devices:

Batteries: Definition, Types, primary batteries- dry cell, Secondary batteries- Lead acid, Ni-Cd, Lithium-Ion Batteries.

Super capacitors- Electrical double layer capacitor, pseudo capacitors and hybrid capacitors.

Fuels cells: Fuel cell working principle, classification of fuel cells-Hydrogen-Oxygen and Methanol-Oxygen, solid oxide fuel cell.

Photovoltaic Cells: Definition, synthesis of semiconductor grade silicon, doping of silicon, construction and working of PV cell.

UNIT-IV

12 Hrs

Corrosion: definition, Types of Corrosion: Dry Corrosion (Direct Chemical attack), Wet Corrosion. Electrochemical analysis- Equilibrium potential methods, Anodization potential methods. Tafel plots and Impedance –Charge transfer resistance. Corrosion Control. Pourbaix diagram: Water-iron system, water-Aluminium

Electroplating: Theory of electroplating, factor affecting nature of electrodeposits. Electroplating of gold using acid, basic and neutral cyanide baths. Electroless plating of copper

Reference Books:

1. Monk, Fundamentals of Electroanalytical Chemistry.
2. B.K. Sharma, Engineering Chemistry
3. Jayaprakash and Venugopal, Engineering Chemistry.

Course Code	Agricultural Microbiology Lab	Course Type	L	T	P	C	CH
B21MI0602		HC	0	0	1.5	1.5	3

Prerequisites/Pre reading for the course:

Students should know importance of the microbiology in agriculture and their handling.

Course Objectives:

1. To acquire the knowledge of eco-friendly microorganisms.
2. To understand plant disease causing pathogens and their effect on crop production.
3. Explore various parameters to assess for environmental pollution level.
4. To facilitate the understanding of impact of industrial effluent on environment.

Mapping of Course Outcomes with Program Outcomes

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21MI0602	CO1	2	1	1	2	1	2	1	1	2	3	2	1	2
	CO2	1	2	2	1	2	1	1		2	2	1	1	1
	CO3	1	2	2	1	1	1	1		3	2	1	1	2
	CO4	1	1	2	2	1	1	2	1	1	2	2	2	1

Course Outcomes:

By the end of the course the student will be able to:

1. Hands-on experience in isolation and culturing of beneficial microorganisms
2. Analyse various techniques involved in testing soil microorganisms for crop productivity.

3. Determine the pollution level and their significance in environment.
4. Categorise the pollutants based on their hazardous effects.

Course Contents

1. Isolation and identification of *Rhizobium* root nodules
2. Isolation and identification *Azospirillum* from roots.
3. Isolation and identification of *Azotobacter* from soil and BGA
4. Isolation and identification of plant pathogens - Fungus and
5. Isolation and identification of plant pathogens - Bacteria.
6. Staining and microscopic examination of VAM.
7. Determination of Biofertilizer capacity in plant growth.
8. Determination of Biocontrols capacity and their interactions

References

1. Mishra RR (2004). Soil Microbiology. First edition, CBS Publishers and distributors, New Delhi.
2. Rangaswami G and Mahadevan A (2002). Disease of Crop Plants in India. Fourth edition, PHI Learning (P) Ltd., New Delhi.
3. Rangaswami G and Bagyaraj DJ (2002). Agricultural Microbiology. Second edition, PHI Learning (P) Ltd., New Delhi.
4. Robert, L Tate (1995). Soil Microbiology. First edition, John Wiley and Sons, Inc. New York.

Course Code	Chemistry Practical–VI	Course Type	L	T	P	C	CH
B21CH0602		HC	0	0	1.5	1.5	3

Prerequisites:

Basic knowledge of ore, alloys and their compositions. Analytical techniques such as TLC and Column chromatography.

Course Objectives:

1. To demonstrate the analysis of given ore, alloy, phenol and biomolecules by titrimetric methods.
2. Exposure to prepare various standard solutions using molarity and normality calculations.
3. Allow independently for the separation of organic compounds with the knowledge of TLC using column chromatographic technique.
4. Analyze the spectral data to obtain the structure of the organic compound.

Course Outcomes:

1. Apply the knowledge on preparation of standard solution, estimation and separation of organic compounds using column chromatographic technique.
2. Estimate the quantitative analysis of organic and inorganic compounds by titrimetric method.
3. Acquire knowledge on various titrimetric and complexometric methods in estimation of ore and organic molecules.
4. Design basic research problems in the analysis of ore, alloy and organic molecules.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
B21CH0602	CO1	3	3	3	3			2			2	3	2	3
	CO2	3	3	2	3			2			2	3	1	2
	CO3	3	3	2	3			2			2	3	2	2
	CO4	2	2	3	3			2			2	3	3	3

Course Contents:

1. Separation of p- and o- nitroaniline by TLC method and column chromatography. (Solvent extraction).
2. Estimation of glucose by Fehling solution method.
3. Estimation of ascorbic acid by iodometric method.
4. Determination of Iodine value of oils by chloramine-T.
5. Study of enzyme kinetics (by taking any one example)
6. Estimation of alpha amino acids by using Ninhydrin by colorimetric method.
7. Estimation of creatinine by Jaffe's method.
8. Separation of α-amino acids by paper chromatography.
9. Estimation of total reducing sugars by DNS (dinitrosalicylic acid) method.
10. Isolation of lactose and casein from milk and estimation of lactose by colorimetric method.
11. Estimation of inorganic phosphate by Fiske- Subbarow Method
12. Isolation of Castor oil from Castor seeds.
13. Preparation nanocellulose from sugar cane bagasse.

References for Practicals:

1. A.I. Vogel, A.R. Tatchell, B.S. Furnis, A.J. Hannaford and P.W.G. Smith, Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
2. F.G. Mann, and B.C. Saunders, Practical Organic Chemistry, Orient-Longman, 1960.
3. O.P. Pandey, D.N. Bajpai and S. Giri, Practical Chemistry, Revised Edition, S. Chand Company Pvt Limited, 2014.
4. J. Mendham, Vogel's Quantitative Chemical Analysis, 6th Ed., Pearson, 2009.
5. G. Svehla, Vogel's Qualitative Inorganic Analysis, Pearson Education, 2002.

Course Code	Evolutionary & Biometrical Genetics Lab	Course Type	L	T	P	C	CH
B21GN0602		HC	0	0	1.5	1.5	3

Prerequisites/Pre reading for the course:

1. Students should have the knowledge of evolution.
2. Students should be aware of the basic mathematical concepts.

Course Objectives:

The Objectives of this course is to:

1. To study various inheritance involving quantitative traits.
2. To compute the statistical analysis for biological data.
3. To calculate the allelic and genotype frequencies with different inheritance data.

Course Outcomes:

After completing the course, the student should be able to:

1. Understand the pattern of quantitative inheritance.
2. Learn the statistical concepts used for data collection.
3. Analyze the data statistically.
4. To predict the allelic variations in the population.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / PO5	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
B21GN0602	CO1	3	3		3	3	2	3		3	3	3	2	
	CO2	3	3	3	3		3	3	2	3	3	3	2	
	CO3	3	3	3	3		3	3		3	3	2		
	CO4	3	3	3		3	3	3		2	3	3	2	

Course Content:

1. Study of Quantitative inheritance in Kernel colour in Wheat/Skin colour in man .
2. Genetic problems on polygenic variance, Heritability and ANOVA
3. Biometrical Computation of:
 - a. Mean, Median and Mode
 - b. Variance, Standard Deviation
- c. Problems on: Student's 't' test and Chi square test
4. Biometrical problems (Minimum 3 problems in each topic)
5. Hardy Weinberg Genetic equilibrium: Study of gene & genotype frequencies. (PTC Tasters & nontasters)
6. Blood group typing using haemagglutination tests and calculation of allele frequencies.
7. To test for colour blindness using Ishihara charts and calculation of allele frequencies

8. Study of frequency of twins in the local population.

Reference Books:

1. Evolution –Stickberger, M. W (1990) Jones and Bartlett, Boston.
2. Evolutionary Genetics by Maynard Smith J (1989), Oxford University press.
3. Genetics and Analysis of Quantitative traits by Lynch. M and B. Walsh (1997). Senauer Associates, Sunderland.
4. Introduction to Quantitative Genetics by Falconer, D (1995) 4th edition Longman, London
5. Introduction to Quantitative Genetics by Falconer, D (1995) 4th edition Longman, London.
6. Population Genetics and Quantitative Genetics by Mari selvi K. Kalyani Publications. 2008.

Course Code	Project	Course Type	L	T	P	C	CH
B21SE0601		HC	0	0	4	4	8

CAREER OPPORTUNITIES

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. Roleplay
11. Group discussion, and soon

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 pre0placement 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 Microbiology, Chemistry, Genetics is not only the 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. 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 University0Industry 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 skills / 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 MOUs with Multi0National Companies, research institutions, and universities abroad to facilitate greater opportunities of employability, students' exchange programs for higher learning and for conducting certification programs.

