REVA
UNIVERSITY
Bengaluru, India

School of Applied Sciences

B.Sc. PMCs

HANDBOOK-2021-2024

Rukmini Knowledge Park
Kattigenahalli, Yelahanka, Bengaluru – 560064
www.reva.edu.in

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Rukmini Educational
Charitable Trust

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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 - many 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 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 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. M. Dhanamjaya
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. Pivate sector and Corporates are also looking for smart science graduaes in a big way. This B.Sc. degree program of REVA University is designed to prepare, scientists, teachers, professionals & administrators who are motivated, enthuastics & creative thinkers to meet the challenges of growing economy as well as to fulfill the growing aspirations of the youth. The program has been developed with an emphasis on knowledge assimilation, application, national and international job market and its social relevance. The outcome-based curriculum designed and followed imbibes required theoretical concepts and practical skills in the domain. By undergoing this program, you will develop critical, analytical thinking and problem-solving abilities for a smooth transition from academic to real-life work environment. The L: T: P structure of teaching and learning under Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) would certainly help our students learn and build competencies needed in this knowledge-based society.

This handy document containing brief information about the 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.

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

Prof.Shilpa BR
Deputy Director, SoAS

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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 15,000+ 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 No. 80 dated 27th 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.

REVA consistently ranked as one of the top universities in various categories because of the diverse community of international students and its teaching excellence in both theoretical and technical education in the fields of Engineering, Management, Law, Science, Commerce, Arts, Performing Arts, and Research Studies. REVA offers 28 Undergraduate Programmes, 22 Full-time and 2 Part-time Postgraduate Programmes, 18 Ph. D Programmes, and other Certificate/ Diploma/Postgraduate Diploma Programmes in various disciplines.

The curriculum of each programme is designed with a keen eye for detail by giving emphasis on hands-on training, industry relevance, social significance, and practical applications. The University offers world-class facilities and education that meets global standards.

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 neededskills. 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 to give them the needed input and build in them confidenceand courage to move forward and accomplish success in their career. The University has also entered 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 topmost priority. The division continuously liaisons between various funding agencies, R&D Institutions, Industries, and faculty members of REVA University to facilitate undertaking innovative projects. It encourages student research projects by forming different research groups under the guidance of senior faculty members. Some of the core areas of research wherein our young faculty members are working include Data Mining, Cloud Computing, Image Processing, Network Security, VLSI and Embedded Systems, Wireless Censor Networks, Computer Networks, IOT, MEMS, Nano- Electronics, Wireless Communications, Bio-fuels, Nano-technology for coatings, Composites, Vibration Energies, Electric Vehicles, Multilevel Inverter Application, Battery Management System, LED Lightings, Renewable Energy Sources and Active Filter, Innovative Concrete Reinforcement, Electro Chemical Synthesis, Energy Conversion Devices, Nano-structural Materials, Photo-electrochemical Hydrogen generation, Pesticide Residue Analysis, Nano materials, Photonics, Nana 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, Counsellors 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 recognised as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal VikasYojana. The Centre conducts several add-on courses in challenging areas of development. It is always active in facilitating student‟s variety of Skill Development Training programs.

The University has collaborations with Industries, universities abroad, research institutions, corporate training organizations, and Government agencies such as Florida International University, Okalahoma State University, Western Connecticut University, University of Alabama, Huntsville, Oracle India Ltd, Texas Instruments, Nokia University Relations, EMC^2, VMware, SAP, Apollo etc, to facilitate student exchange and teacher–scholar exchange programs and conduct training programs. These collaborations with foreign universities also facilitate 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 RatnaProf. 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. P. Balaram, Former Director IISc., 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.

REVA organises 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 recognised 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 class‟s everyday to students, faculty members, administrative staff and their family members and organizes yoga camps for villagers around.

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 centres
- 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 M.Sc. degree programs in Bio-Chemistry, Bio-Technology, Chemistry, Physics, Mathematics, Bioinformatics, Microbial Technology and B Sc with various combinations viz, Biotechnology Biochemistry and Genetics, Medical Laboratory Technology, Physics Chemistry and Mathematics, Physics Mathematics and Computer Science, Mathematics Statistics and Computer Science, Bioinformatics, Computer Science and Mathematics, Chemistry Microbiology and Genetics 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

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B. Sc – PMCs (Physics, Mathematics, Computer Science)

Programme Overview

Physics and Chemistry are parts of physical sciences belong to the group of natural science. Natural science is concerned with description, prediction and understanding of natural phenomenon based on empirical evidence from observation and experimentation. Mathematics helps in developing empirical relations among various parameters for better understanding of the Phenomenon. Since centuries, study of physics, chemistry and mathematics in universities has become a practice because of their importance for understanding nature and life on the Universe.

The School of Applied Sciences at REVA UNIVERSITY has designed to offer B.Sc. in Physics, Mathematics, and Computer Science as an undergraduate degree programme to create motivated, enthusiastic, thinking and creative graduates to fill the roles as teachers, professors, scientists, professionals and administrators.

Indian economy is experiencing an upward growth right from the beginning of 21st century except for a short stint during the mid of present decade necessitating well qualified science graduates to work as teachers, professors, scientists, 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. The proposed B.Sc. (PMCs) programme designed will act as a foundation and first degree to prepare teachers, professors, scientists, professionals, and administrators to meet the challenges of growing economy as well as to meet the growing aspirations of the youth.

The B.Sc. (PMCs) programme at the School of Applied Sciences, has been developed by the members of the faculty based on interactions with various universities, research establishments and industries in India and abroad.The curriculum is outcome based and it imbibes required theoretical concepts and practical skills in the domain. By undergoing this programme, students develop critical, analytical thinking and problem-solving abilities for a smooth transition from academic to real-life work environment. In addition, students are trained in communication skills and interdisciplinary topics to enhance their scope. The above-mentioned features of the programme, advanced teaching and learning resources,and experience of the faculty members with their strong connections with industry and research organizations makes this programme unique.

Program Educational Objectives (PEO's)

The programme educational objectives of the **B Sc (P.M. Cs)** course is to prepare graduates to

PEO-1 Demonstrate problem solving skills in Physics, Mathematics, and Computer Science by communicating effectively either leading a team or as a team member.

PEO-2 Express oral and written interpersonal skills to understand, learn and advance their careers through research developments and seeking higher education.

PEO-3 Understand the professional, ethical, and social responsibilities through lifelong learning skills

Program Outcomes (POs)

PO 1. Demonstrate the knowledge in the areas of physics, Mathematics, and Computer Science.

PO 2. Apply the fundamentals of physics, mathematics to formulate, solve and interpret complexproblems.

PO 3. Comprehend, analyze, model, and solve complex problems in the areas of physics, mathematics, and computer science.

PO 4. Recognize the need to expertise in the areas of physics, mathematics, and Computer Scienceby self-upgradation through lifelong learning.

PO 5. Communicate with clarity and coherence, both written and verbally.

PO 6. Exhibit professional and ethical responsibility.

PO 7. Encourage collaborative learning through group activities and hands-on learning.

PO 8. Use latest computer techniques and tools to carry out scientific investigations and developnew solutions and solve problems related to environment and society.

Programme Specific Outcomes (PSOs)

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

PSO1. Acquire a strong conceptual foundation in physics, mathematics and Computer Science using latest software tools and technologies, along with analytical and managerial skills to arrive at cost effective and optimum solutions.

PSO2. Implant the capacity to apply theoretical concepts to design and develop solutions.

Eligibility for B. Sc (PMCs) program

Pass in PUC/10+2 examination with physics, mathematics and Computer Science as compulsory subjects and obtained minimum 45% marks (40% in case of candidate belonging to SC/ST category) in the above subjects taken together of any Board recognized by the respective State Government /Central Government/Union Territories or any other qualification recognized as equivalent thereto.

REVA University Academic Regulations
Bachelor's degree (3 years) Programs
(Applicable for the programs offered from 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's 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‟s 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 Biology, Maths, Computer Science
BSc in Biotechnology, Biochemistry, Genetics

BSc in Medical Lab Technology
BSc in Physics, Maths, Computer Science
BSc in Microbiology, Chemistry, Genetics

3. Duration and Medium of Instructions:

3.1 Duration: The bachelor‟s 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‟s 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: "Business Research Methodology" in BBA (Honors) program, "Auditing and Corporate Governance" in B Com (Industry Integrated) program are examples of courses to be studied under respective programs.

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, 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 **Core Course:** A course which should compulsorily be studied by a candidate choosing a particular program of study

4.2.3 **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

4.2.4 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

4.2.5 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**

4.2.6 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 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.

4.2.7 **"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's degree** Programs (6 Semesters) is given below:

Sl. 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 / Councilor 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 asequivalent 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 / Councilor 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 qualificationrecognized 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 minimum45% 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) Physics, Chemistry and Mathematics (PCM) b) Mathematics, Statistics and Computer Science (MStCs) c) Physics, Mathematics and Computer Science (PMCs) d) Microbiology, Chemistry, Genetics (MCG	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 any other qualification recognized as equivalent there to.
	11	**B Sc in** a) Bioinformatics – Biology, Computer Science & Mathematics (BCsM) b) Biotechnology, Biochemistry, Genetics c) Medical Laboratory Technology (BMLT)	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 StatutoryBodies, 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 C**ourses of Study**:

Different C**ourses of Study** are labeled as follows:

a. Foundation Course (FC)
b. Core Course (CC)
c. Hard Core Course (HC)
d. Soft Core Course (SC)
e. Open Elective Course (OE)
f. 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 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	B. Com (Industry Integrated) degree, BBA (Industry Integrated) degree, and BCA
120	B. Com (Honors), BBA (Honors), BBA (Entrepreneurship) and B Sc (Honors)
120	BA - Journalism, English, Psychology, BA - Tourism, History & Journalism, BA - Political Science, Economics & Journalism, BA - Performing Arts, English Psychology, BSc in Physics, Chemistry, Maths, BSc in Maths, Statistics, Comp Sci., BSc in Bioinformatics Biology, Maths, Computer Science, BSc in Biotechnology, Biochemistry, Genetics, BSc in Medical Lab Technology, 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. Indian Constitution

4. Human Rights

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) and Open Elective (OE).**

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 in excess to prescribed number of credits for the award of 3 year degree in the registered program.

The Add on Proficiency Certification / Diploma/ Minor degree/ Honor Degree: so issued to the candidate contains the courses studied and grades earned.

9 Assessment and Evaluation

9.1 The Scheme of Assessment will have two parts, namely.

i. Internal Assessment (IA); and
ii. 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 student"s 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 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 student‟s 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 an **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. No	**Type of Assessment**	**when**	**Syllabus Covered**	**Max Marks**	**Reduced to**	**Date by which the process must be completed**
1	Test-1	During 8th week	First 50%	30	15	8th week
2	Assignment / quiz / presentation / any other assessment method as decided by the School	On or before 8th week (10 marks)				
3	Test -2	During 16th Week	Second 50%	30	15	16th Week
4	Assignment / quiz / presentation / any other assessment method as decided by the School	On or before 16th Week (10 marks)				
5	SEE	19/20th Week	100%	100	50	20th 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 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 based on:

a) Knowledge of relevant processes.
b) Skills and operations involved;
c) 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 second test for theory courses); the performance assessments of the mid-term test includes performance in the conduction of 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 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) = ∑(Ci x Gi) / ∑Ci** where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

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	3X9=27
Course 2	3	A	8	3X8=24
Course 3	3	B+	7	3X7=21
Course 4	4	O	10	4X10=40
Course 5	1	C	5	1X5=5
Course 6	2	B	6	2X6=12
	16			129

Thus, **SGPA = 129 ÷ 16 = 8.06**

Example No. 2

Course	Credit	Grade letter	Grade Point	Credit Point (Credit x Grade point)
Course 1	4	A	8	4X8=32
Course 2	4	B+	7	4X7=28
Course 3	3	A+	9	3X9=27
Course 4	3	B+	7	3X7=21
Course 5	3	B	6	3X6=18
Course 6	3	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: **CGPA = ∑(Ci x Si) / ∑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 (Numerical Index)**	**Letter Grade**	**Performance**	**FGP**
	G			**Qualitative Index**
9 >= CGPA 10	10	O	Outstanding	Distinction
8 >= CGPA < 9	9	A+	Excellent	
7 >= CGPA < 8	8	A	Very Good	First Class
6 >= CGPA < 7	7	B+	Good	
5.5> = CGPA < 6	6	B	Above average	Second Class
> 5 CGPA < 5.5	5.5	C+	Average	
> 4 CGPA <5	5	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.

Challenge Valuation:

a. A student who desires to apply for challenge valuation shall obtain a photocopy 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 applying 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.

22. About any specific case of ambiguity and unsolved problem, the decision of the Vice-Chancellor shall be final.

Mapping of Course Outcomes with programme Outcomes

Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0101	CO1	3	2	2						3	2
	CO2	2	2	2						3	2
	CO3	3	2	2						3	3
	CO4	3	2	2						3	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0101	CO1	3	3	3	3	2		1	3	3	3
	CO2	3	3	3	3	2		3	3	3	3
	CO3	3	3	3	2	2		2	3	3	3
	CO4	3	3	3	2	2				2	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0101	CO1	3	3	3	3	2		1	3	3	3
	CO2	3	3	3	3	2		3	3	3	3
	CO3	3	3	3	2	2		2	3	3	3
	CO4	3	3	3	2	2		2	3	3	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0102	CO1	3	2	2		1				3	3
	CO2	3	2	2		1				3	3
	CO3	2	2	2		1				3	2
	CO4	3	2	2		1				2	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0102	CO1	2			3		2	2	2	2	2
	CO2	3	2		3		2	1	3	3	3
	CO3	3	3	3	3			2	2	3	2
	CO4	3	3	2	2		2	2	3	3	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0102	CO1	3	3	3	3			2	3	3	2
	CO2	3	3	3	3			2	3	3	3
	CO3	3	3	3	2			2	3	3	3
	CO4	3	3	3	2				1	3	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0201	CO1	3	2	2						3	2
	CO2	2	2	2						3	3
	CO3	3	2	2						3	3
	CO4	3	2	2						3	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0201	CO1	3	2	2	3					3	2
	CO2	2	2	2	2					3	3
	CO3	3	2	2	3					3	3

	CO4	3	2	2	2					3	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0201	CO1	2	2	3	3	3				2	2
	CO2	2	2	2	3	2				2	2
	CO3	2	3	2	3	2				2	2
	CO4	2	3	2	3	2				2	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0202	CO1	3	2	2				1	1	3	3
	CO2	3	2	2	1			1	1	3	3
	CO3	2	2	2	1			1	1	3	3
	CO4	3	2	2				1	1	3	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0202	CO1	3	2	2						3	3
	CO2	3	2	2	1					3	3
	CO3	2	2	2	2					3	3
	CO4	3	2	2						3	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0202	CO1	-	-	2	2	3	3	2	2	-	-
	CO2	-	-	2	2	2	3	2	2	-	-
	CO3	-	-	2	3	2	3	2	2	-	-
	CO4	-	-	2	3	2	3	2	2	-	-
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0301	CO1	3	3	3	3			1	3	3	3
	CO2	3	2	1	2			1	2	3	3
	CO3	3	2	2	2			1	2	3	3
	CO4	3	3	3	3			1	3	3	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0301	CO1	3	3	3	3					3	3
	CO2	3	3	3	3					3	3
	CO3	3	2	2	2					3	2
	CO4	3	3	2	2					3	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0301	CO1	3	3	3	2			0	3	2	3
	CO2	3	3	2	2			2	2	3	2
	CO3	3	3	2	2			2		3	3
	CO4	3	3	3	2			0	3	2	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0302	CO1	3	2	2	1	1	1		1	3	2
	CO2	3	2	2	1	1			1	3	3
	CO3	3	2	2	1	1			1	3	2
	CO4	3	2	2	1			1	1	2	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0302	CO1	3	3	3	3					3	1
	CO2	3	3	2	1					2	2
	CO3	3	3	2	2					2	1
	CO4	3	3	3	1					3	3

Course Code	POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0302	CO1	3	3	3	3				3	3	1
	CO2	3	3	2	1				1	2	2
	CO3	3	3	2	2			1	3	2	1
	CO4	3	3	3	1				3	3	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0401	CO1	3	3	2	3	2				3	3
	CO2	3	3	2	3	2				3	3
	CO3	3	3	2	3	2				3	2
	CO4	3	2	1	2	2				3	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0401	CO1	3	2	1	1					3	2
	CO2	3	2	3	2					3	2
	CO3	3	3	3	3					3	3
	CO4	3	2	2	2					3	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0401	CO1	3	3	3	0			1	2	3	3
	CO2	3	3	2	2				2	3	1
	CO3	3	2	2	1			1	1	3	2
	CO4	3	2	2	2			2	2	3	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0402	CO1	3	2	2	2				1	3	2
	CO2	3	2	2	2				1	3	3
	CO3	3	2	2	2				1	3	2
	CO4	3	2	2	2				1	2	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0402	CO1	3	2	1	1			1	3	3	2
	CO2	3	2	3	2				2	3	2
	CO3	3	3	3	3			2	3	3	3
	CO4	3	2	2	2			2	2	3	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0402	CO1	3	3	3				1	2	3	3
	CO2	3	3	2	2				2	3	1
	CO3	3	2	2	1			1	1	3	2
	CO4	3	2	2	2			2	2	3	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0501	CO1	3	3	3	2	3				3	2
	CO2	3	3	3	3	3				3	3
	CO3	3	3	2	3	2				3	2
	CO4	3	3	2	3	3				3	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0501	CO1	3	3	2	3	2				2	1
	CO2	3	3	2	3	2				3	3
	CO3	3	3	1	3	2				3	2
	CO4	3	3	2	3	2				3	3

Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0501	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	PSO1	PSO2
B21MT0502	CO1	3	3	2	2					2	3
	CO2	3	2	2	3					3	2
	CO3	3	2	3	2					3	2
	CO4	3	3	3	2					3	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0502	CO1	3	3	3	2					2	3
	CO2	3	3	3	2					3	3
	CO3	2	2	1	3					3	2
	CO4	3	2	3	1					2	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0502	CO1	1	2	2	1			2		3	1
	CO2	1	2	1	3			3		3	1
	CO3	1	2	2	2			2		3	1
	CO4	1	1	2	1			2	2	3	1
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0601	CO1	3	3	3	3			1	2	3	3
	CO2	3	3	3	3			1	2	3	3
	CO3	3	2	2	2			2	2	3	3
	CO4	3	2	2	2			2	2	3	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0601	CO1	3	3	2	3	2				2	1
	CO2	3	3	2	3	2				3	3
	CO3	3	3	1	3	2				3	2
	CO4	3	3	2	3	2				3	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0601	CO1	-	-	2	3	2	2	2	2	-	2
	CO2	-	-	3	3	2	2	2	2	-	2
	CO3	-	-	2	2	3	2	3	2	-	3
	CO4	-	-	2	3	2	2	3	2	-	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0602	CO1	3	3	2	2			1	2	2	3
	CO2	3	2	2	3			1	2	3	2
	CO3	3	2	3	2			2	2	3	2
	CO4	3	3	3	2			2	2	3	3
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0602	CO1	3	3	3	2	2				2	3
	CO2	3	3	3	2	2				3	3
	CO3	2	2	1	3	2				3	3
	CO4	2	2	1	2	1				2	2
Course Code	**POs/COs**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2

B21CP0602	CO1	-	2	2	3	2	3	2	2	2	2
	CO2	-	2	2	3	2	3	2	2	2	2
	CO3	-	-	-	3	2	3	2	3	3	2
	CO4	-	-	-	3	2	3	2	3	3	2

B. Sc – PMCs
(Physics, Mathematics and Computer Science)
Scheme of Instruction and Detailed Syllabus
(Effective from the Academic Year 2021-24)

Scheme of Instruction **Duration: 6 Semesters (3 Years)**

Sl. No	Course Code	Title of the Course	CC/FC/ HC/SC	Credit Pattern				
				L	T	P	Total	Hours
FIRST SEMESTER								
1	B21AHK101	Language – II: Kannada -I	FC	1	1	0	2	3
2	B21AHH101	Language – II: Hindi -I						
3	B21AHA101	Language – II: Additional English -I						
4	B21AHE101	Communicative English - I	FC	1	1	0	2	3
5	B21MT0101	Mathematics-I	HC	3	0	0	3	4
6	B21PH0101	Mechanics and Properties of matter	HC	3	0	0	3	4
7	B21CP0101	Programming In C	HC	3	0	0	3	4
8	B21MTS111	Elementary Number Theory	SC	3	0	0	3	4
9	B21MTS112	Discrete Mathematics and Graph theory						
10	B21MTS113	Fuzzy Mathematics						
11	B21LSM101	Constitution of India and Professional Ethics	MC	0	0	0	0	2
		Practicals						
12	B21MT0102	Mathematics practical-I	HC	0	0	1.5	1.5	3
13	B21PH0102	Physics Practical-I	HC	0	0	1.5	1.5	3
14	B21CP0102	C Programming Lab	HC	0	0	1.5	1.5	3
Total Credits				**14**	**2**	**4.5**	**20.5**	**32**
SECOND SEMESTER								
15	B21AHK201	Language – II: Kannada -II	FC	1	1	0	2	3
16	B21AHH201	Language – II: Hindi-II						
17	B21AHA201	Language – II: Additional English-II						
18	B21AHE201	Communicative English - II	FC	1	1	0	2	3
19	B21MT0201	Mathematics-II	HC	3	0	0	3	4
20	B21PH0201	Heat and Thermodynamics	HC	3	0	0	3	4
21	B21CP0201	Programming in Python	HC	3	0	0	3	4
22	B21PHS211	Physics of Clouds	SC	3	0	0	3	4
23	B21PHS212	Renewable Energy Resource						
24	B21PHS213	Lasers and Fibre Optics						
25	B21ASM201	Environmental Science	MC	0	0	0	0	2
		Practicals						
26	B21MT0202	Mathematics practical-II	HC	0	0	1.5	1.5	3
27	B21PH0202	Physics Practical-II	HC	0	0	1.5	1.5	3
28	B21CP0202	Programming in Python - LAB	HC	0	0	1.5	1.5	3
Total Credits				**14**	**2**	**4.5**	**20.5**	**33**

THIRD SEMESTER								
29	B21AHK301	Language – II: Kannada -III	FC	1	1	0	2	3
30	B21AHH301	Language – II: Hindi -III						
31	B21AHA301	Language – II: Additional English -III						
32	B21MT0301	Mathematics-III	HC	3	0	0	3	4
33	B21PH0301	Optics and spectroscopy	HC	3	0	0	3	4
34	B21CP0301	Relational Data Base Management Systems	HC	3	0	0	3	4
35	B21CPS311	Data Communication and Networks	SC	3	0	0	3	4
36	B21CPS312	Multimedia Computing						
37	B21ASO301	Classical Optimization	OE	3	0	0	3	4
38	B21ASO303	Physics in Everyday Life						
39	B21ASO304	Water Technology						
40	B21SHM301	Skill Development Program	MC	0	0	0	0	2
		Practicals						
42	B21MT0302	Mathematics practical-III	HC	0	0	1.5	1.5	3
43	B21PH0302	Physics Practical-III	HC	0	0	1.5	1.5	3
44	B21CP0302	RDBMS LAB	HC	0	0	1.5	1.5	3
Total Credits				**16**	**1**	**4.5**	**21.5**	**32**
FOURTH SEMESTER								
45	B21AHK401	Language – II: Kannada -IV	FC	1	1	0	2	3
46	B21AHH401	Language – II: Hindi -IV						
47	B21AHA401	Language – II: Additional English-IV						
48	B21MT0401	Mathematics-IV	HC	3	0	0	3	4
49	B21PH0401	Electricity and Electromagnetism	HC	3	0	0	3	4
50	B21CP0401	Unix and Shell Programming	HC	3	0	0	3	4
51	B21MTS411	Complex Analysis	SC	3	0	0	3	4
52	B21MTS412	Operations Research						
53	B21MTS413	Topology						
54	B21PTM401	Soft Skill Training	MC	0	0	0	0	2
55	B21SHM401	Skill Development Program	MC	0	0	0	0	2
		Practicals						
56	B21MT0402	Mathematics practical-IV	HC	0	0	1.5	1.5	3
57	B21PH0402	Physics Practical-IV	HC	0	0	1.5	1.5	3
58	B21CP0402	Unix and Shell Programming- LAB	HC	0	0	1.5	1.5	3
		Total Credits		**13**	**1**	**4.5**	**18.5**	**32**
FIFTH SEMESTER								
59	B21MT0501	Mathematics-V	HC	3	0	0	3	4
60	B21PH0501	Quantum Mechanics and Nuclear Physics	HC	3	0	0	3	4
61	B21CP0503	Basics of Web Programming	HC	3	0	0	3	4
62	B21PHS511	Astronomy and Astro Physics	SC	3	0	0	3	4
63	B21PHS512	Nano Materials						
64	B21PHS513	Optoelectronics						
65	B21SHON01	MOOC/SWAYAM	SC	2	0	0	2	2

66	B21SHM501	Skill Development Program	MC	0	0	0	0	1

		Practicals						
67	B21MT0502	Mathematics practical-V	HC	0	0	1.5	1.5	3
68	B21PH0502	Physics Practical-V	HC	0	0	1.5	1.5	3
69	B21CP0502	Web Programming-LAB	HC	0	0	1.5	1.5	3
		Total Credits		**14**	**0**	**4.5**	**18.5**	**28**
	SIXTH SEMESTER							
70	B21MT0601	Mathematics-VI	HC	3	0	0	3	4
71	B21PH0601	Solid State Physics	HC	3	0	0	3	4
72	B21CP0601	Data Mining and Data Warehousing	HC	3	0	0	3	4
73	B21CPS611	Software Engineering	SC	3	0	0	3	4
74	B21CPS612	Cryptography and Network Security						
75	B21SH0601	Project	HC	0	0	4	4	8
		Practicals						
76	B21MT0602	Mathematics practical-VI	HC	0	0	1.5	1.5	3
77	B21PH0602	Physics Practical-VI	HC	0	0	1.5	1.5	3
78	B21CP0602	Machine Learning LAB	HC	0	0	1.5	1.5	3
		Total Credits		**12**	**0**	**8.5**	**20.5**	**33**
		Total Credits of all Semesters		**83**	**6**	**31**	**120**	**190**

Semester-wise Summary of Credit Distribution

Semester	**L**	**T**	**P**	**Total**	**Total Hours**
I	14	2	4.5	20.5	32
II	14	2	4.5	20.5	32
III	16	1	4.5	21.5	32
IV	13	1	4.5	18.5	32
V	14	0	4.5	18.5	29
VI	12	0	8.5	20.5	33
Total Credits	**83**	**6**	**31**	**120**	**190**

B. Sc – Physics, Mathematics, Computer Science (PMCs) Detailed Syllabus

(Effective from Academic Year 2021)

FIRST SEMESTER

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

Course Objectives:

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

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

Course Outcomes:

ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗು ನಾಟಕ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

1. ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
2. ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
3. ಸಾಮಾಜಿಕ ಅರಿವು ಮೂಡಿಸುತ್ತದೆ
4. ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.

ಅಡಾಹಿಜ ಔಣಾಭಿಡಾಫ

ಗಟಖಾ–ಖ: 7 ಎಡಿ

1. ಸತ್ಯವಂತೆ ಹಡೆದವ್ವ – ಜನಪದ ಗೀತೆ
2. ನೆಲಕಿರಿವೆನೆಂದು ಬಗೆವಿರೆ ಛಲಕಿರಿವೆಂ– ರನ್ನ
3. ಚಿತ್ರಮಪಾತ್ರೆ ರಮತೇ ನಾರಿ– ಜನ್ನ

ಗಟಖಾ–ಖಖ: 7 ಎಡಿ

1. ಅಬ್ಧಿಯುಮೊರ್ಮೆ ಕಾಲವಶದಿಂ ಮರ್ಯಾದೆಯಂ ದಾಂಟದೇ.... – ನಾಗಚಂದ್ರ
2. ವಚನಗಳು – ಬಸವಣ್ಣ
3. ತಿರುನೀಲಕಂಠರ ರಗಳೆ – ಹರಿಹರ

ಗಟಖಾ–ಖಖಖ: 6 ಎಡಿ

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

ಗಟಖಾ–ಖಗಿ: 6 ಎಡಿ

1. ಮೊಳ್ಳುಗಟ್ಟಿ – ಟಿ.ಪಿ. ಕೈಲಾಸಂ

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು:

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. ಸೀಮಾತೀತ 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. ಹಂಪ ನಾಗರಾಜಯ್ಯ, ಸಾಂಗತ್ಯ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
6. ನಾರಾಯಣ ಪಿ. ವಿ, ಚಂಪೂ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
7. ಕಾಳೇಗೌಡ ನಾಗವಾರ, ತ್ರಿಪದಿ, ರಗಳೆ ಮತ್ತು ಜಾನಪದ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
8. ಸಂ. ಬೆನಗಲ್ ರಾಮ ರಾವ್ ಮತ್ತು ಪಾನ್ಯಂ ಸುಂದರ ಶಾಸ್ತ್ರೀ, ಪುರಾಣ ನಾಮ ಚೂಡಾಮಣಿ, ಪ್ರಕಾಶಕರು ಪ್ರಸಾರಾಂಗ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ. 2010
9. ಡಾ. ಚಿದಾನಂದ ಮೂರ್ತಿ, ವಚನ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013
10. ಸಂ. ಬಸವರಾಜು ಎಲ್. ಸರ್ವಜ್ಞನ ವಚನಗಳು, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2012
11. ಸಂ. ಬಸವರಾಜು ಎಲ್. ಅಕ್ಕನ ವಚನಗಳು, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 1997
12. ಸಂ ಮರುಳಸಿದ್ದಪ್ಪ ಕೆ, ನಾಗರಾಜ ಕಿ.ರಂ. ವಚನ ಕಮ್ಮಟ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016

13. ನರಸಿಂಹಾಚಾರ್. ಡಿ.ಎಲ್., ಪಂಪ ಭಾರತ ದೀಪಿಕೆ, ಪ್ರಕಾಶಕರು ಡಿ.ವಿ.ಕೆ ಮೂರ್ತಿ ಪ್ರಕಾಶನ, ಮೈಸೂರು. 2012
14. ರಂಜಾನ್ ದರ್ಗಾ, ಶರಣರ ಸಮಗ್ರ ಕ್ರಾಂತಿ, ಪ್ರಕಾಶಕರು. ಲೋಹಿಯಾ ಪ್ರಕಾಶನ, ಬಳ್ಳಾರಿ. 2015
15. ದೇಶಪಾಂಡೆ ಎಸ್.ಎಲ್. ಬೇಂದ್ರೆ ಶರೀಫರ ಕಾವ್ಯಾಯಾನ, ಪ್ರಕಾಶಕರು ದೇಸಿ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2013
16. ಸಂ. ಬಿ.ಎಸ್. ಕೇಶವರಾವ್. ಕೈಲಾಸಂ ಕನ್ನಡ ನಾಟಕಗಳು, ಪ್ರಕಾಶಕರು ಅಂಕಿತ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2005
17. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು –2014
18. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

Mapping of Course Outcomes with programme Outcomes

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

Course Code	Language-II: Hindi - I	Type	L	T	P	C	Hrs/Week
B21AHH101		FC	**1**	**1**	0	2	3

Course Objectives:

This course aims to provide for the student to

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

Course Outcomes:

अध्ययन की समाप्ति पर अध्येता –

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

Course Contents:

इकाई – 1: कहानी, संस्मरण **7 hrs**

कहानी – नशा – प्रेमचंद
कहानी – सुखमय जीवन – चंद्रधर शर्मा गुलेरी

स ंस्मरण – शरत के समय चबतभयभ कु छ समय – अमृतलभल नभगर

इकाई – 2: कहभनी, आत्मकथभ **7 hrs**

कहभनी – मरने से पहले – र्ीष्म सभहनी

कहभनी – लभल हवेली – चशवभनी

रेखाचित्र – घीसा – महादेवी वमाा

इकाई – 3: ए ाँ ी, व्यंग्य रचनभ **6 hrs**

ए ाँ ी – आवाज ा नीलाम – धमावीर

भारती व्यंग्य रचनभ – र ोड़े और

र ोचियें – हररशंकर परसभई

इकाई – 4: अनुवभद **6 hrs**

अनुवाद : अंग्रेज़ी – चहन्दी (शब्द एवं अनुच्छे द)

सूचना : प्रत्येक इकाई 25 अंक के लिए लनर ारित है |

References:

1. सुबोध व्यवहभररक चहन्दी – िॉ. कु लदीप गुप्ता
2. अचरनव व्यवहभररक चहन्दी – िॉ.परमभनन्द गुप्ता
3. चहन्दी सभचहत्य कभ इचतहभस - िॉ. नभगेन्द्र
4. आधुचनक चहन्दी सभचहत्य कभ इचतहभस - िॉ. बच्चन चसंह
5. चहन्दी सभचहत्य कभ नवीन इचतहभस - िॉ. लभल सभहब चसंह
6. शुद्ध चहन्दी कै से बोले कै से चलखे- पृथ्वीनभथ पभण्डे
7. कभयभालय अनुवभद चनदेचशकभ
8. संक्षेपण और पल्लवन - के.सी.रभचियभ&तुमन चसंग

Mapping of Course Outcomes with programme Outcomes

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

Course Code	Language-II: Additional English - I	Type	L	T	P	C	Hrs/Week
B21AHA101		FC	1	1	0	2	3

Course Objectives:

This course aims to provide for the student:

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

Course Outcomes:

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

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

Course Contents:

Unit-I: Values and 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 and 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:

1. Tagore, Rabindranath. *Gitanjal*i. Rupa Publications, 2002.
2. Wordsworth, William. *The Complete Works of William Wordsworth*. Andesite Press, 2017.
3. Munro, Hector Hugh. *The Complete Works of Saki*. Rupa Publications, 2000.
4. Shakespeare, William. *The Complete Works of William Shakespeare*. Sagwan Press, 2015.
5. Chindhade, Shirish. *Five Indian English Poets: Nissim Ezekiel, A.K. Ramanujan, ArunKolatkar, DilipChitre, R. Parthasarathy*. Atlantic Publications, 2011.
6. Dickens, Charles. *The Signalman and Other Horrors: The Best Victorian Ghost Stories of Charles Dickens: Volume 2*. Createspace Independent Publications, 2015.
7. Anderson, Hans Christian. *The Fir Tree*. Dreamland Publications, 2011.
8. Colvin, Sidney (ed). *The Works of R. L. Stevenson. (Edinburgh Edition)*. British Library, Historical Prints Edition, 2011.
9. Bishop, Elizabeth. *Poems*. Farrar, Straus and Giroux, 2011.
10. Swift, Jonathan. *Gulliver"s Travels*. Penguin, 2003.
11. Dickinson, Emily. *The Complete Poems of Emily Dickinson*. Createspace Independent Publications, 2016.
12. Brooke, Rupert. *The Complete Poems of Rupert Brooke*. Andesite Press, 2017.
13. King, Martin Luther Jr. &James M. Washington. *I Have a Dream: Writings and Speeches That Changed The World.* Harper Collins, 1992.
14. Keller, Helen. *The Story of My Life*. Fingerprint Publishing, 2016.
15. Green, David. *Contemporary English Grammar Structures and Composition*. New Delhi:

MacMillan Publishers, 2010.
16. Thorpe, Edgar and Showick Thorpe. *Basic Vocabulary*. Pearson Education India, 2012.
17. Leech, Geoffrey and Jan Svartvik. *A Communicative Grammar of English*. Longman, 2003.
18. Murphy, Raymond. *Murphy"s English Grammar with CD*. Cambridge University Press, 2004.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21AHA101	**CO1**					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

Course Code	Communicative English-I	Type	L	T	P	C	Hrs/Week
B21AHE101		FC	**1**	**1**	0	2	3

Course Objectives:

This course aims to provide for the student:
1. To enhance functional communication skills.
2. To develop functional use of language in professional contexts.
3. To utilize oral presentations in multiple contexts.
4. To apply effective written skills in formal communication.

Course Outcomes:

After successful completion of the course, students will be able to
1. Identify pressing issues relating to society, environment and media.
2. Develop a process-oriented approach to writing.
3. Apply the grammatical skills developed during the course aptly.
4. Demonstrate a good command over language usage and refined interpersonal skills.

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.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21AHE101	**CO1**					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

Course Code		Type	L	T	P	C	Hrs/Week
B21MT0101	**Mathematics-I**	HC	3	0	0	3	4

Course Objectives:

This course aims to provide for the student to:

1. Familiarize the concepts of matrix and its applications in various fields.
2. Understand the concepts of successive differentiation and n^{th} order derivative.
3. Learn about reduction formula with limit and without limit and differentiation under integral sign - Leibnitz rule.
4. Understand the concept of partial differentiation

Course Outcomes:

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

1. Apply the matrix theory to solve the system of linear equations.
2. Compute derivatives of any order and apply Leibniz‟ theorem to find nth derivative of product of two functions.
3. Gain the Knowledge of reduction formulae and differentiation under integral sign by Leibnitz rule to solve integral equations.
4. Master the fundamental concepts of partial differentiation and apply Euler‟s theorem for homogeneous functions.

Course Contents:

Unit-I: Differential Calculus

Recap of differentiation, Successive differentiation, nth derivatives of standard functions $\left(e^{ax},(ax+b)^n,\frac{1}{(ax+b)},\log(ax+b),\sin(ax+b),\cos(ax+b),e^{ax}\sin(bx+c),e^{ax}\cos(bx+c)\right)$ Leibnitz theorem (without proof)-problems. Indeterminate forms $\left(\frac{0}{0},\frac{\infty}{\infty},\ 0X\infty,\ \infty-\infty,\ 0^0,1^\infty\right)$, L‟ Hospital rule and problems. Taylor‟s and McLaurin‟s theorem for a function of one variable and problems (without proof).

Unit-II: Partial differentiation

Partial derivatives – definition and simple problems, Euler‟s theorem (with proof) , Eulers extension theorem (without proof) problems, total derivatives, differentiation of implicit functions, partial differentiation of composite functions- problems. Jacobians – Definition, properties and problems.

Unit-III: Integral Calculus

Reduction formulae for $\int \sin^n x\,dx$, $\int \cos^n x\,dx$, $\int \tan^n x\ dx$ and $\int sin^m x\ cos^n x\ dx,$

evaluation of theses integrals with standard limits and problems.$(Illutration\ of\ reduction\ formulae\ for\ \int cot^n x\ dx,\ \int sec^n x\ dx,\ \int cosec^n x\ dx,)$. Leibnitz‟s rule- differentiation under integral sign and problems. Applications of Integral Calculus: Computation of length of arc and plane area for standard curves in Cartesian and polar forms.

Unit-IV: Linear Algebra

Elementary operations - Rank of a Matrix, – Inverse of a matrix using row operations - Echelon Forms - Normal Forms - System of Homogeneous and non-homogeneous equations- Gauss elimination method and Gauss-Jordon method. Eigenvalues - Eigenvectors - Cayley Hamilton Theorem (without proof) and diagonalization.

Textbooks:

1. Shanthi Narayan and P.K. Mittal, Differential Calculus, Reprint. New Delhi: S. Chand & Company Ltd., 2011.
2. Shanthi Narayan, Integral Calculus, Reprint. New Delhi: S. Chand and Company Ltd., 2004.
3. G K Ranganath, Textbook of B.Sc. Mathematics, Revised ed. New Delhi, India: S Chand and Company Ltd., 2011.
4. A R Vashista, Matrices, Krishna PrakashanaMandir, 2003.
5. Krishnamoorty V K and Mainra V P and Arora J L, An Introduction to Linear Algebra, Reprint. New Delhi, India: Affiliated East West Press Pvt. Ltd., 2003.
6. G K Ranganath, Textbook of B.Sc., Mathematics, Revised ed. New Delhi, India: S Chand and Co., 2011.
7. M D Raisinghania, Ordinary and Partial Differential Equations, S Chand, and Co. Pvt. Ltd.,

2014.

Reference Books:

1. Serge Lang – First Course in Calculus
2. S. Narayanan & T. K. Manicavachogam Pillay, Calculus: S. Viswanathan Pvt. Ltd., 1996, vol. I & II.
3. S. Narayanan and T.K. Manicavachogam Pillay, Calculus (I & II). Chennai, India: S. Viswanathan Pvt. Ltd., 1996.
4. Joseph Edwards, An elementary treatise on the differential calculus: with applications and numerous examples, Reprint. Charleston, USA: BiblioBazaar, 2010.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0101	**CO1**	3	2	2						3	2
	CO2	2	2	2						3	2
	CO3	3	2	2						3	3
	CO4	3	2	2						3	2

Course Code	Mechanics and Properties of Matter	Type	L	T	P	C	Hrs/Week
B21PH0101		HC	3	0	0	3	4

Course Objectives:

This course aims to provide for the student to:

1. Impart the knowledge about relative motion. Inertial and non- inertial reference frames
2. Familiarize with the concepts of conservation of energy and momentum to elastic and inelastic collisions.
3. Familiarize with the concepts of fluid mechanics for practical application.
4. Equip with the basics of physics related to elasticity and to solve problems involving Forces, Moments, Centroids and Moment of inertia the relationship between the motion of bodies and moment of inertia.

Course Outcomes:

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

1. Describe inertial and non-inertial frames and relative motion of the objects.
2. Apply the concepts of conservation of energy and momentum to elastic and inelastic Collisions.
3. Summarize the concepts of surface tension and viscosity and calculate critical velocity of the fluid.
4. Apply Newton's laws of the motion to ascertain the state of the systems and calculate the moment of inertia using free body diagrams and to compute the elastic properties of materials.

Course Contents:

UNIT-I

Motion of a particle: The position vector r (t) of a moving particle and its Cartesian components, Velocity and acceleration as the vector derivatives, radial and transverse component of velocity and acceleration for arbitrary planar motion, deduction of results for uniform circular motion centripetal force, Numerical problems.

Frames of reference: Inertial reference frames with examples and uniform rectilinear motion in an inertial frame, The Galilean principle of relativity, Galilean transformation equation. Motion in a non-inertial reference frame uniformly accelerated rectilinear motion, Illustration of an earth as non–inertial frame, concept of weightlessness by freely falling elevator, Qualitative discussion on centrifugal force, Coriolis force, Numerical problems.

UNIT-II **12 Hrs**

Conservation Laws

Conservation of linear momentum for a system of two particles, Rocket motion in a uniform gravitational field (single stage rocket equation -- with and without gravity), Multistage rocket, Elastic and inelastic collisions, Elastic Head on collision, Elastic oblique collision in lab frame, reduced mass, Numerical problems.

Conservation of energy: Conservative and non-conservative forces with examples, conservation of energy in a conservative force field, Applications – **1.** Vertical oscillations of loaded light spiral spring, **2.** Calculation of escape velocity in the gravitational field of the earth, Numerical problems. Numerical problems.

Conservation of Angular Momentum: Relation between torque and angular momentum, Law of conservation of angular momentum concept of Central forces, Kepler‟s laws of planetary motion – derivation using Newton‟s law of gravitation, Numerical problems.

UNIT-III **12 Hrs**

Fluid Dynamics: Streamline and Turbulent Flow Viscosity -|Basic concepts, Variation of viscosity of liquids with temperature and pressure, Expression for critical velocity, Reynold‟s number and its significance, coefficient of viscosity, Stokes law (no derivation) terminal velocity-Expression for terminal velocity of small ball falling through viscous fluid, Numerical problems.

Surface Tension: Basic concepts-pressure inside curved liquid surface-examples, Surface tension by drop-weight method, surface tension of mercury by Quincke‟s method, Numerical problems.

UNIT-IV **12 Hrs**

Rigid body Dynamics: Moment of Inertia of a body, radius of gyration. Theorem of Moment of Inertia-Parallel and perpendicular axes theorem with proofs (2-D case), Expression for kinetic energy of a rigid body, Calculation of moment of inertia of a disc, annular ring, solid sphere, and rectangular bar, Conservation of angular momentum with illustrations, Numerical problems.

Elasticity: Hooke's law, Moduli of elasticity, Poisson‟s ratio Relation between elastic constants - limiting values, bending moment, Theory of single cantilever, Torsion-calculation of couple per UNIT twist, The torsion pendulum, Static Torsion, Numerical problems.

Reference Books:

1. J C Upadhyay. Classical Mechanics, 11th edition, Himalaya, 2014.
2. David Halliday. Robert Resnick, and Jearl Walker, Fundamentals of Physics, Sixth Edition, John Wiley & Sons, Inc. 2001.
3. Charles Kittel etal., Berkeley. Physics -Vol. 1, 2nd edition McGraw Hill Education (India),2011.
4. D.S. Mathur. Mechanics, 5th edition, S Chand publications 2016.
5. Brijlal & Subramanyam. Properties of Matter, S Chand and Co., New Delhi 2002.

Course Code	Programming In C	Type	L	T	P	C	Hrs/Week
B21CP0101		HC	3	0	0	3	4

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0101	**CO1**	3	3	3	3	2		1	3	3	3
	CO2	3	3	3	3	2		3	3	3	3
	CO3	3	3	3	2	2		2	3	3	3
	CO4	3	3	3	2	2				2	2

Course Objectives:

The students should be made to:

- To develop enough familiarity with the specific environment.
- To develop an understanding of fundamental programming logic and programming techniques.
- To develop programming language of different numerical methods which are used to solve scientific and engineering problems.
- To emphasize on developing the student‟s ability to analyze and solve problems by using high level programming language.

OUTCOMES:

Course Outcomes:

At the end of the course, the student should be able to:

- To understand the Syntax and Structure of the C Programming.
- Design C Programs for Problems.
- Write and Execute C Programs for simple applications.

Course Content:

UNIT-1

Introduction to C **12Hrs**

Fundamentals in C, Programming Languages, Types of software's, Compilers, Operating Systems, Program execution phases, Character set , Number systems, Format specifiers, Identifiers, Keywords ,Variables, Data Types, Declaration of Variable , Assigning Values to Variables , Initialization, Constants, Comments, Basic Structure of a 'C' program , Header files, Pre Processor, Programming Examples, Arithmetic, Logical & Relational operator, Increment & Decrement operators, Conditional operator, Assignment operator, Unary, Binary, Bitwise, Ternary Operators, Expressions, Type conversions, Operator precedence, Basic Console I/O functions- Formatted Console I/O, Unformatted Console I/O.

Control statements, Arrays and Pointers **12Hrs**

Conditional Branching if statement, if-else statement, Nested if statement, switch statement, Un-Conditional Branching, looping: while loop, do-while loop, for loop, Break and continue statements. Introduction to Arrays, one dimensional arrays, Array Initialization, Array indexing, Reading and displaying elements, Two dimensional arrays, Programming Examples. Pointers: Declaration of Pointer Variables, Assigning Address to Pointer Variables, pointer to pointer, Programming Examples.

Functions and Structures **12Hrs**

Functions: Advantages of using functions, Function Prototype, Defining a function, Calling a function, Return statement, Types of functions, Recursion, Nested functions, main ( ) function, Library Function, Local and global variables, Call by value and call by references, programming Examples. Structures: Definition, Declaration, Initialization of a Structure, Structure Variables, typedef statement, Programming Examples.

Unions, Strings and Files **12Hrs**

Unions: Definition, Declaration, Initialization, Accessing union members. Strings: Definition, Declaring and Initializing String variables, Reading and Writing Strings, String manipulation functions, Array of Strings. The %s format specifier –The gets () and puts () functions. Files – declaration of file, File modes, opening and closing a file, reading, and writing a file. Programming examples & exercises.

TEXTBOOKS:

1. Anita Goel and Ajay Mittal,” Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt Ltd, Pearson Education in South Asia, 2011.
2. YESHVANT KANETKAR “LetUs C” BPB Publications,2011.
3. E Balaguruswamy,” Computing Fundamentals & C Programming”, McGraw Hill Education India.

REFERENCE BOOKS:

1. BYRON GOTTFRIED, Fourth Edition, “PROGRAMMING WITH C”, SCHAUM‟S OUTLINES.

2. Kernighan B.W and Ritchie D.M,” The C Programming language”, Second Edition, Pearson Education,2006.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0101	CO1	3	3	3	3	2		1	3	3	3
	CO2	3	3	3	3	2		3	3	3	3
	CO3	3	3	3	2	2		2	3	3	3
	CO4	3	3	3	2	2		2	3	3	3

Course Code	Elementary Number Theory	Type	L	T	P	C	Hrs/Week
B21MTS111		SC	3	0	0	3	4

Course objectives:

This course aims to provide for the student to:

1. Concepts of divisibility, congruence, greatest common divisor and prime factorization.
2. The concept of congruence and use various results related to congruences.
3. Certain number theoretic functions and their properties.

Course Outcomes:

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

1. Define, interpret and apply the concepts and principles of number theory to perform numerical and symbolic computations.
2. Apply different types of proof writing techniques in number theory to related situations.
3. Develop an in-depth understanding of the principles of number theory.
4. Communicate the number theory concepts, techniques and principles effectively in both written and oral form.

Course Contents:

Unit-I: **7 hrs**

Divisibility, Greatest common divisor, The Fundamental theorem of Arithmetic, Euclid“s algorithm, prime numbers and Prime number theorem.

Unit-II: **6 hrs**

Definition and basic properties of congruence, Residue and complete residue systems.

Unit-III: **7 hrs**

Linear congruence“s, The Euler-Fermats Theorem, Chinese remainder theorem and applications.

Unit-IV: **6 hrs**

Arithmetic functions- Mobius function $\mu(n)$, Euler quotient function $\varphi(n)$, relation connecting μ and φ, Product formula for $\varphi(n)$ and properties of φ.

Suggested Textbooks and References:

1. D. M. Burton – Elementary Number Theory, Tata McGraw-Hill, New Delhi, 6th Ed.,
2. Niven, H. S. Zuckerman, and H. L. Montgomery – An Introduction to the Theory of Numbers, New York, John Wiley and Sons, Inc., 2004, 5th Ed.,
3. G. A. Jones and J. M. Jones – Elementary Number Theory, Springer,1998
4. T. M. Apostal – Mathematical Analysis, Addison Wesley, Narosa, New Delhi, 2nd Ed.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MTS111	**CO1**	3	3	2	1	1				3	2
	CO2	3	3	2	2	1				3	2
	CO3	3	3	2	2	1				3	2
	CO4	3	3	2	2	1				3	2

Course Code	Discrete Mathematics and Graph Theory	Type	L	T	P	C	Hrs/Week
B21MTS112		SC	3	0	0	3	4

Course objectives:

This course aims to provide for the student:

1. To study the set theory, logic, Recurrence relations and functions and to know the application of Boolean Algebra to switching theory
2. To understand and apply the fundamental concepts in graph theory
3. To apply graph theory-based tools in solving practical problems

Course Outcomes:

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

1. Apply operations on discrete structures such as sets, relations, functions and Recurrence relations.
2. Apply Boolean Algebra to switching theory and their minimization techniques and Phase structure grammars and languages, Finite state Machine, Recognition in regular languages.
3. Apply principles and concepts of graph theory in practical situations
4. Apply the theory and applications of graphs, fundamental theorems and their proofs and computer applications such as networks of communication, data organizations, computational devices, the flow of computation.

Course Contents:

Unit-I: Set Theory & Logic **14 hrs**

Set theory fundamental operations; propositions; negation; disjunction and conjunction; implication and equivalence; truth tables; laws of Logic; predicates.

Unit-II: Logic & Relations 14 **hrs**

Quantifiers; rules of Inference; methods of proofs.

Relations; representation of relations by graphs; properties of relations; equivalence relations and partitions. Hasse diagrams.

Unit-III: Graph Theory -1 **14 hrs**

Konigsberg‟s Bridge problem, Utilities problem, Seating Problems, graphs, Representation of graphs, directed graphs, incidence, adjacency, degree, Indegree, out degree, regular graphs, complete graphs, Null graphs, Bipartite graphs, Isomorphism, directed graphs, sub graphs, Walk, Trail, Path, Cycle, Connected and Disconnected graphs, Components, Euler graphs, Operation on graphs Complement of Graph, Partition, Decomposition.

Unit-IV: Graph Theory -2 **14 hrs**

Hamiltonian paths, Circuits, Planar graphs, Kuratowskiís graphs, Different representation of planar graphs, Geometric dual, Trees and some properties of trees, Rootedand binary tree, Spanning tree and fundamental circuits. Matrix representation, Incidence matrix, Cutset matrix, Circuit matrix, Adjacency matrix.

Suggested Textbooks and References:

1. Elements of Discrete Mathematics 3rdedition by C.L. Liu, Tata Macgraw Hill Publishers (2008).
2. Discrete Mathematical Structures with Applications to Computer Science by J.P. Trembley and R. Manohar, TataMagrawHill Publishers
3. Kenneth H. Rosen, Discrete Mathematics and its Application, Fifth edition, Tata McGraw-Hill Publishing company PVT. Ltd., New Delhi, 2003.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MTS112	**CO1**	3	3	2	2	3				3	3
	CO2	3	2	3	2	2				2	3
	CO3	3	3	2	3	3				3	2
	CO4	3	3	3	2	2				3	3

Course Code	**Fuzzy Mathematics**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21MTS113		SC	3	0	0	3	4

Course objectives:

This course aims to provide for the student to:

1. Study the fuzzy sets, basic operation on fuzzy sets and inverse fuzzy operations.
2. Study fuzzy subsets and its properties.
3. Read and analyze the concept of fuzzy rings.

Course Outcomes:

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

1. Analyse the concept of fuzzy set and fuzzy logic using fuzzy operations.
2. Apply the concept of fuzzy sum, fuzzy product and Cartesian product on real world problems.
3. Analyse the concept of algebra of fuzzy relations and logic connectives.
4. Analyse the concept of fuzzy invariant subgroups and fuzzy subrings.

Course Contents:

Unit-I:

Introduction- Fuzzy Subsets-Lattices and Boolean Algebras- L fuzzy sets-operations on fuzzy – level sets – properties of fuzzy subsets.

Unit-II:

Algebraic product and sum of two fuzzy subsets-properties satisfied by Addition and product-cartesian product of fuzzy subsets.

Unit-III:

Introduction- Algebra of fuzzy relations-logic-connectives.

Unit-IV:

Some more connectives-Introduction-fuzzy subgroup-homomorphic image and Preimage ofsubgroupoid. Fuzzy invariant subgroups-fuzzy subrings.

Suggested Text Books and References:

1. S. Nanda and N. R. Das Fuzzy Mathematical concepts, Narosa Publishing House, New Delhi, 2010.
2. M.Ganesh, Introduction to Fuzzy Sets & Fuzzy Logic, Prentice Hall of India Pvt. Ltd., 2006.
3. J.N. Mordeson and P.S. Nair, Fuzzy Mathematics.

Mapping of Course Outcomes with Programme Outcomes

Course Code	**POs/ COs**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**
B21MTS113	**CO1**	3	3	2	2					2	3
	CO2	3	2	2	3					3	2
	CO3	3	2	3	2					3	2
	CO4	3	3	3	2					3	3

Course Code	Constitution of India and Professional Ethics	Type	L	T	P	C	Hrs/Week
B21LSM101		MC	**0**	0	0	0	2

Course objectives:

This course aims to provide for the student:

1. To impart knowledge on Constitution of India.
2. To facilitate the understanding of Fundamental Rights, Duties and other Rights which is been given by our law.
3. To facilitate 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 successful completion of this course, the student will be able to:

1. Explain the Indian constitutional provisions and fololtow them.
2. Demonstrate the fundamental rights and human rights.
3. Explain the duties and more importantly practice them in a right way.
4. Adopt the habit of raising their voice against a unconstitutionality of any laws and upon any legal discrimination as we have session of debates on Constitutional validity.

Course Contents:

Unit-I: 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

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

Unit-III: Judiciary

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

Unit-IV: Professional Ethics

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

Suggested Textbooks and References:

1. M.V. Pylee, An introduction to Constitution of India.
2. M. Govindarajan, S. Natarajan, V.S. Senthil Kumar, Engineering Ethics.

3. D.D. Basu, Introduction to constitution of India.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21LSM101	CO1						2				
	CO2						3				
	CO3						3				
	CO4						3				

Course Code	Mathematics Practicals-I	Type	L	T	P	C	Hrs/Week
B21MT0102		HC	0	0	1.5	1.5	3

Course Objectives:

This course aims to provide for the student to:

1. Practical introduction to understand the concepts of matrix and its applications in various fields.
2. Acquire skill in solving problems on partial derivatives using *Python*.
3. Gain proficiency in using *Python* to solve the problems of differential calculus.

Course Outcomes:

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

1. Demonstrate the use of *Python* to understand concepts in matrix theory.
2. Be familiar with the built-in functions to find derivatives of any order in differential calculus.
3. Acquire problem solving skills on partial derivatives.
4. Exhibit the use of *Python* to understand and interpret the concepts of reduction formula.

Course Contents:

List of Programmes

1. Introduction to Python: Basic syntax, variable types, basic operators, numbers, strings, lists, tuples, functions and input/output statements.
2. Some simple programs to understand the relational, conditional and logical operators.
   i) Compare two numbers (less than, greater than) using if statement
   ii) Sum of natural numbers using while loop
   iii) Finding the factors of a number using for loop.
   iv) To check the given number is prime or not (use if... else statement).
   v) Find the factorial of a number (use if...if...else). vi) Simple programs to illustrate logical operators (and, or, not)
3. Python commands to reduce given matrix to echelon form and normal form with examples.
4. Python program/command to establish the consistency or otherwise and solving system of linear equations.
5. Python command to find the nth derivatives.
6. Python program to find nth derivative with and without Leibnitz rule.
7. Obtaining partial derivative of some standard functions

8. Verification of Euler"s theorem, its extension and Jacobean.
9. Python program for reduction formula with or without limits.
10. Plotting 2D and 3D graphs.

Suggested Text Books and References:

1. Farukh Khalilov and Tayyip oral, Math coding Python, 5th Edition, USA-2020.
2. Joakim Sundnes, Introduction to Scientific programming with Python, 2nd Edition, Springer 2010.
3. Allen Downey and Jeffrey Elkner, Learning with Python, 5th Edition, Springer, 2015.
4. Eric Matthes, A Hands-On, Project-Based Introduction to Programming- Python Crash Course, 2nd Edition:
5. Al Sweigart, Automate The Boring Stuff With Python: Practical Programming For Total Beginners, 2nd Edition.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0102	**CO1**	3	2	2		1				3	3
	CO2	3	2	2		1				3	3
	CO3	2	2	2		1				3	2
	CO4	3	2	2		1				2	3

Course Code	**Physics Practicals-I**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21PH0102		HC	0	0	1.5	1.5	3

Course Objectives:

This course aims to provide for the student to:

1. Develop the ability to apply knowledge of Physics and engineering in calculating the elastic properties of materials.
2. Equip with the ability to use the techniques, modern engineering tools necessary for material testing.
3. Impart the knowledge of using the techniques, skills for testing of fluid properties.
4. Equip with knowledge of professional and ethical responsibility in the areas of material testing.

Course Outcomes:

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

1. Compute the values of moment of inertia, mass and density and elastic properties of a given material through experiment.
2. Compute the liquid properties like surface tension and viscosity of the given liquid through experiment.
3. Calculate acceleration due to gravity through experiment.
4. Apply the knowledge of professional and ethical responsibility in the areas of material testing.

Course Contents:

Any EIGHT of the following experiments:

1. Determination of the acceleration due to gravity using Bar pendulum (graphical method).
2. Determination of moment of inertia, mass of Fly wheel
3. Determination of surface tension of water and kerosene by Drop weight method.
4. Determination of surface tension and angle of contact of mercury by Quincke‟s method
5. Determination of Young‟s modulus by single cantilever method.
6. Determination of young‟s modulus, the rigidity modulus, bulk modulus, and Poisson‟s ratio using Searle‟s double bar.
7. Determination of the rigidity modulus by Torsional pendulum
8. Determination of the Young‟s modulus by stretching method.
9. Determination of terminal velocity of small ball falling through viscous fluid and its coefficient of viscosity.
10. Verification of perpendicular axis theorem using Torsion pendulum.

Textbooks:

1. B Saraf etc, - Physics through experiments, Vikas Publications,2013.
2. D P Khandelwal –A Laboratory Manual of Physics for Undergraduate Classes, Vikas Publications First ed, 1985.
3. Advanced Practical Physics for Students – Worsnop & Flint, Methuen & Co, London, 1923.
4. An Advanced Course in Practical Physics, D Chattopadhyay, P C Rakshit, B Saha, New Central Book Agency (P) Limited, Kolkata, Sixth Revised Edition, 2002.
5. C.L. Arora, BSc Practical Physics, S Chand & Co, New Delhi, Revised Edition, 2007.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0102	CO1	3	2	2		1				3	3
	CO2	3	2	2		1				3	3
	CO3	2	2	2		1				2	3
	CO4	3	2	2		1				3	2

Course Code	C PROGRAMMING LAB	Type	L	T	P	C	Hrs/Week
B21CP0102		HC	0	0	1.5	1.5	3

Pre-requisites of C programming Lab

1. Basic Computer Knowledge
2. Know syntax rules and coding style. ...

COURSE OUTCOME

1. To recognize and understand the syntax and construction of C programming code.
2. To gain experience of procedural language programming.
3. To know the steps involved in compiling, linking and debugging C code.
4. To understand using header files

5. To learn the methods of iteration or looping and branching.
6. To make use of different data-structures like arrays, pointers, structures and files.

PART – A

1. Write a C Program to find area and circumference of circle.
2. Write a C program to display the size of every data type using “sizeof” operator.
3. Write a C Program to Make a Simple Calculator Using switch…case.
4. Write a C program to add two numbers using Call by value.
5. Write a C program to find the Fibonacci series using recursion.
6. Write a C program to find number of occurrences of vowels, Consonants, word, space and the special characters in the given statement.
7. Write a C program to read and print the student information using structure.
8. Write a C Program to open, read and close the File.

PART - B

During practical examination, the External and Internal examiners may prepare exam question paper related to theory syllabus apart from Part-A. (A minimum of 6 Programs has to be prepared).

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0102	**CO1**	3	3	3	3			2	3	3	2
	CO2	3	3	3	3			2	3	3	3
	CO3	3	3	3	2			2	3	3	3
	CO4	3	3	3	2				1	3	2

SECOND SEMESTER

Course Code	Language – II: Kannada -II	Type	L	T	P	C	Hrs/Week
B21AHK201		FC	**1**	**1**	0	2	3

Course Objectives:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಎರಡನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು,
ಲೇಖನಗಳು ಹಾಗು ಪ್ರವಾಸ ಕಥನ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು,
ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

1. ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
2. ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಮೂಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.

3. ಅವರಲ್ಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಭಾಷೆ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ
4. ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

Course Outcomes:

ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಲೇಖನಗಳು ಹಾಗು ಪ್ರವಾಸ ಕಥನ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

1. ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
2. ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
3. ಸಾಮಾಜಿಕ ಅರಿವು ಮೂಡಿಸುತ್ತದೆ
4. ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.

Course Contents:

ಗಱಋ–ಖ: ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯ

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

ಗಱಋ–ಖಖ: ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯ

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

ಗಱಋ–ಖಖಖ: ಲೇಖನಗಳು

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

ಗಱಋ–ಖಗ: ಪ್ರವಾಸ ಕಥನ

ನನ್ನೊಳಗಿನ ಹಾಡು ಕ್ಯೂಬಾ – ಜಿ.ಎನ್. ಮೋಹನ್

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು :

1. ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸೀಮಾತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
3. ಹಂಪ ನಾಗರಾಜಯ್ಯ, ಸಾಂಗತ್ಯ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010

4. ಕಾಳೇಗೌಡ ನಾಗವಾರ, ತ್ರಿಪದಿ, ರಗಳೆ ಮತ್ತು ಜಾನಪದ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
5. ಸಂ. ಬೆನಗಲ್ ರಾಮ ರಾವ್ ಮತ್ತು ಪಾನ್ಯಂ ಸುಂದರ ಶಾಸ್ತ್ರೀ, ಪುರಾಣ ನಾಮ ಚೂಡಾಮಣಿ, ಪ್ರಕಾಶಕರು ಪ್ರಸಾರಾಂಗ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ. 2010
6. ಸಂ. ಬಸವರಾಜು ಎಲ್. ಸರ್ವಜ್ಞನ ವಚನಗಳು, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್,ಮೈಸೂರು. 2012
7. ಮರುಳಸಿದ್ದಪ್ಪ ಕೆ, ಷಟ್ಪದಿ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು.2010
8. ಸಂ. ಸೇತುರಾಮ ರಾವ್ ಅ.ರಾ., ಶ್ರೀ ಲಕ್ಷ್ಮೀಶನ ಜೈಮಿನಿ ಭಾರತ(ಮೂಲ-ತಾತ್ಪರ್ಯ-ಸಚಿತ್ರ), ಪ್ರಕಾಶಕರು ಕಾಮಧೇನು ಪುಸ್ತಕ ಭವನ, ಬೆಂಗಳೂರು. 2010
9. ಸಂ. ಜಿ.ಎಸ್.ಭಟ್., ಕುಮಾರವ್ಯಾಸನ ಕರ್ಣಾಟ ಭಾರತ ಕಥಾಮಂಜರಿ ಪ್ರವೇಶ, ಪ್ರಕಾಶಕರು ಅಕ್ಷರ ಪ್ರಕಾಶನ, ಹೆಗ್ಗೋಡು, ಸಾಗರ. 2006
10. ಕೀರ್ತನಾಥ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಟ್ರಸ್ಟ್, ಧಾರವಾಡ. 2009
11. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು -2014
12. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 201

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21AHK201	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		

Course Code	Language-II: Hindi - II	Type	L	T	P	C	Hrs/Week
B21AHH201		FC	1	1	0	2	3

Course Objectives:

This course aims to provide for the students to:

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

Course Outcomes:

अध्ययन की समाप्ति पर अध्येता –

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

Course Contents:

इकाई – 1: चवता: प्राििीन џव·आधुचन **7 hrs**

कबीर के दोहे

कचवतभ –जचलयभँवभलभ बभग में बसंत- सुर्द्रभकु मभरी

िौहभन कचवतभ – सुर्भष की मृत्यु पर - धमवीर

र्भरती

इकाई – 2: चवता: प्राििीन џव·आधुचन **7 hrs**

तुलसीदस े पद

कचवतभ – पाषाणी – नागाजुन

कचवतभ –िलनभ हमभरभ कभम है।- चशवमंगल चसंह सुमन

इकाई – 3: चवता: प्राििीन џव·आधुचन **6 hrs**

मीरभबभई के पद

कचवतभ – मेरे सपने बहुत नहीं हैं- चगररररभज कु मभर

मभथुर कचवतभ – अर्ी न होगभ मेरभ अंत – चनरभलभ

इकाई – 4: **6 hrs**

अनुवाद : शब्द џव·अनुच्छे द (चहन्दी से अग्रेज़ी)

सूचना: प्रत्येक इकाई 25 अंक के लिए लनर्ारित है |

Text book

1. चहन्दी पभठ्य पुस्तक – रेवभ चवश्वचवद्यभलय |

References

1. सुबोध व्यवहभररक चहन्दी – िॉ. कु लदीप गुि
2. अचर्नव व्यवहभररक चहन्दी – िॉ.परमभनन्द गुि
3. चहन्दी सभचहत्य कभ इचतहभस - िॉ. नभगेन्द्र
4. आधुचनक चहन्दी सभचहत्य कभ इचतहभस - िॉ. बच्चन चसंह
5. चहन्दी सभचहत्य कभ नवीन इचतहभस - िॉ. लभल सभहब चसंह
6. शुद्ध चहन्दी कै से बोले कै से चलखे- पृथ्वीनभथ पभण्डे
7. संक्षेपण एवं पल्लवन

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21AHH201	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			

Course Code	Language-II: Additional English - II	Type	L	T	P	C	Hrs/Week
B21AHA201		FC	1	1	0	2	3

Course Objectives:

This course aims to provide for the students:

1. To assess ecological and environmental concerns through literature.
2. To identify the inequal structures of power in society.
3. To compare and relate the position of men and women in society.
4. To interpret the representation of society in popular culture.

Course Outcomes:

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

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

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:

1. Agrawal, K.A. *Toru Dutt the Pioneer Spirit of Indian English Poetry - A Critical Study*. Atlantic Publications, 2009.
2. Latham, Edward Connery (ed). *The Poetry of Robert Frost*. Holt Paperbacks, 2002.
3. Gale, Cengage Learning. *A Study Guide for Tomas Rivera's The Harvest*. Gale, Study Guides, 2017.
4. Basu, Tejan Kumar. *The Life and Times of C.V. Ram*an. PrabhatPrakashan, 2016.
5. Rozewicz, Tadeusz. *New Poems*. Archipelago, 2007.
6. Manohar, Murli. *Critical Essays on Dalit Literature*. Atlantic Publishers, 2013.
7. Hansda, SowvendraShekhar. *The Adivasi Will Not Dance: Stories*. Speaking Tiger Publishing Private Limited, 2017.
8. Jacobs, Harriet. *Incidents in the Life of a Slave Girl*. Createspace Independent Publication, 2014.
9. Das, Kamala. *Selected Poems*. Penguin Books India, 2014.
10. Tagore, Rabindranath. *Selected Short Stories of Rabindranath Tagore*. Maple Press, 2012.

11. Gale, Cengage Learning.*A Study Guide for Jamaica Kincaid's Girl*. Gale, Study Guides, 2017.
12. Kipling, Rudyard. *The Absent-Minded Beggar*. Hardpress Publishing, 2013.
13. Doyle, Arthur Conan. *The Hound of the Baskervilles*. General Press, 2017.
14. Dixson, Robert J. *Everyday Dialogues in English*. Prentice Hall India Pvt Ltd., 1988.
15. Turton, Nigel D. *ABC of Common Errors*. Mac Millan Publishers, 1995.
16. Samson, T. (ed.) *Innovate with English.* Cambridge University Press, 2010.
17. Kumar, E Suresh, J. Savitri and P Sreehari (ed). *Effective English*. Pearson Education, 2009.

Mapping of Course Outcomes with programme Outcomes

Course Code	**POs/ COs**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**
B21AHA201	**CO1**					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

Course Code	**Communicative English-II**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21AHE201		FC	1	1	0	2	3

Course Objectives:

This course aims to provide for the students:

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

Course Outcomes:

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

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

Course Contents:

UNIT –I: Language Acquisition

Remedial Grammar: Questions & Negatives; Questions Tags**; Writing Skills:** Email Writing; **Activities:** Group Discussions**; Literature:** Alphonse Daudet - The Last Lesson.

UNIT – II: Persuasive Skills

Remedial Grammar: Past Simple & Past Perfect; **Writing Skills:** Report Writing**; Activities:** Book & Movie Reviews; **Literature:** Lord Alfred Tennyson – Ulysses.

UNIT – III: Cognitive Skills

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

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. Dixson, 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.

Mapping of Course Outcomes with programme Outcomes

Course Code	**POs/ COs**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**
B21AHE201	**CO1**					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

Course Code	**Mathematics-II**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21MT0201		HC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students to:

1. Make the students to learn fundamental concepts of groups.
2. Make the students to develop the knowledge of differential calculus in polar coordinates.
3. Solve differential equations.

Course Outcomes:

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

1. Explain the classification of finitely generated abelian groups and subgroups.
2. Understand the concept of normal groups and quotient groups.
3. Interpret and apply polar coordinates to solve the problems.
4. Identify and solve the linear differential equations.

Course Contents:

Unit-I: Group Theory-I **14 hrs**

Definition and examples of groups – Some general properties of Groups, subgroups, Group of permutations – Cyclic permutations – Even and odd permutations. Order of an element of a group – Subgroups – Cyclic groups problems and theorems. Cosets, Index of a group, Lagrange"s theorem, consequences.

Unit-II: Group theory-II **14 hrs**

Normal Subgroups, Quotient groups – Homomorphism. – Kernel of homomorphism – Isomorphism - Automorphism – Fundamental theorem of homomorphism.

Unit-III: Differential Calculus **14 hrs**

Polar coordinates – angle between the radius vector and the tangent at a point on a curve– angle of intersection between two curves – Pedal equations– Derivative of arc length in Cartesian, Parametric and Polar form (without proof). Curvature of plane curves - formula for radius of curvature in Cartesian, parametric, polar and pedal forms, (Centre of curvature - evolutes. Singular points – Asymptotes –Envelopes- Illustrative examples only).

Unit-IV: **14 hrs**

Differential equations of first order and first degree- Exact differential equations, reducible to exact, (close to M and N)

Linear Differential equations: Definitions, complete solution, rules for finding complementary functions, inverse operator, rules for finding particular integral. Method of variation of parameter. Cauchy"s and Legendre linear equation.

Textbooks:

1. Vashista, A First Course in Modern Algebra, 11th ed.: Krishna PrakasanMandir, 1980.
2. Shanthi Narayan and P.K. Mittal, Differential Calculus, Reprint. New Delhi: SChand and Co. Pvt. Ltd., 2014.
3. M.D. Raisinghania, Ordinary and Partial Differential Equations, S Chand and Co. Pvt. Ltd., 2014.

Reference Books:

1. I.N. Herstien – Topics in Algebra.
2. Joseph Gallian – Contemporary Abstract Algebra, Narosa Publishing House, New Delhi, Fourth Edition.
3. J.B. Fraleigh – A first course in Abstract Algebra.
4. M.D. Raisinghania, Advanced Differential Equations, S Chand and Co. Pvt.Ltd., 2013.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0201	**CO1**	3	2	2						3	2
	CO2	2	2	2						3	3
	CO3	3	2	2						3	3
	CO4	3	2	2						3	2

Course Code	Heat and Thermodynamics	Type	L	T	P	C	Hrs/Week
B21PH0201		HC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students to:

1. Impart knowledge about basics of physics to solve problems involving mean velocity, probable velocity and van der Waals‟s equation.
2. Explain the relationship between the laws of radiation different laws of radiation and to explain thermal conductivity in solids.
3. Familiarize with fundamental laws of Thermodynamics.
4. Familiarize with the principles of Thermodynamics for practical applications.

Course Outcomes:

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

1. Apply the laws of Kinetic theory of gases and concept of Low Temperature Physics to analyse and explain the problems in thermodynamics.
2. Demonstrate the concepts of different laws to explain the nature of radiation emitted by various bodies.
3. Analyse the heat flow in different bodies by the concepts of thermal conductivity and thermodynamics.
4. Interpret scientific information of heat and thermodynamics.

Course Contents:

Unit-I

Kinetic theory of gases: Basic assumptions of kinetic theory, Degrees of freedom, Principle of equipartition of energy based on kinetic theory of gases, U=3/2 RT-derivation, Relation between molar specific heats and degrees of freedom, Atomicity of mono, di and polyatomic gases. Maxwell‟s law of distribution of molecular velocity (no derivation)-its interpretation, deduction of most probable velocity, mean velocity and root mean square velocity, Derivation of expression for mean free path Andrew‟s isothermals, Vander walls equations-derivation -expression for critical constants, Numerical Problems.

Low Temperature Physics: Ideal and real gases, porous plug experiment and its theory, Joule Thomson expansion-expression for the temperature of inversion, inversion curve, Relation between temperature of inversion and critical temperature of gas, Numerical Problems.

Unit-II

Radiation: Black body radiation and its spectral energy distribution, Kirchhoff‟s law, Stefan-Boltzmann's law, Wien‟s displacement law, Rayleigh-Jeans law Planck‟s quantum theory of radiation, Stefan's law, Derivation of Planck's law of radiation - Deduction of Rayleigh-Jeans' law and Wien‟s displacement law from Planck‟s radiation law, Induced absorption, spontaneous and stimulated emission of radiation, Einstein's coefficients under thermal equilibrium condition, Numerical Problems.

Thermal conductivity: Equation of flow of heat through a solid bar. Determination of the thermal conductivity of a bad conductor by Lee and Charlton method. Numerical Problems.

Unit-III

Thermodynamics-I: Thermodynamic coordinates, concept of heat, work, and internal energy, The Zeroth law of Thermodynamics, Indicator diagrams, Isothermals and Adiabatic changes –

Expression for work done, The relation between pressure, volume, and temperature in an adiabatic change, First law of Thermodynamics-mathematical formulation.

Second law of thermodynamics – Reversible and irreversible process, The Carnot engine – expression for efficiency, the Carnot's theorem-its proof. reversibility of Carnot‟s cycle, Refrigerators-principle of working and coefficient of performance, Second law of thermodynamics-Kelvin Planck‟s statement and Clausius statement, Qualitative discussion on petrol and dieselengine, Numerical Problems.

Unit-IV

Thermodynamics-II: Thermodynamic scale of temperature and its identity with perfect gas scale, Clausius-Clapeyron first latent heat equation., The concept of Entropy, Entropy of ideal gas, Change of entropy in reversible and irreversible cycles. Principle of increase of entropy –Clausius inequality, Entropy and II law of Thermodynamics, Concept of absolute zero and the third law of thermodynamics, thermodynamic potentials – internal energy, Gibb‟s free energy, Helmholtz free energy and their significance, Maxwell‟s equations, Numerical Problems.

Reference Books:

1. Brijlal and Subramanyam, Heat and Thermodynamics 5th edition, S. Chand & Co, 2016.
2. J. B. Rajam. Heat and Thermodynamics for Degree Students, Edition, 9. Publisher, S. Chand & Co., 1981.
3. D.S. Mathur: Heat, S. Chand & Co,1995.
4. David Halliday. Robert Resnick, and Jearl Walker, Fundamentals of Physics, Sixth Edition, John Wiley & Sons, Inc. 2001.
5. Charles Kittel & others, Berkeley Physics -Vol. 2, 2nd edition McGraw-Hill Education (India) 2011.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0201	**CO1**	3	2	2	3					3	2
	CO2	2	2	2	2					3	3
	CO3	3	2	2	3					3	3
	CO4	3	2	2	2					3	2

Course Code	Programming in Python	Type	L	T	P	C	Hrs/Week
B21CP0201		HC	3	0	0	3	4

Course Objectives:

1. To know the basics of algorithmic problem solving to do input/output with files in Python
2. To use Python data structures –- lists, tuples, dictionaries.
3. To develop Python programs with conditionals and loops.
4. To read and write simple Python programs using files.

Course Outcomes:

Course Outcomes:

After completion of the course the student shall be able to:

1. Develop algorithmic solutions to simple computational problems, simple Python programs for solving problems.
2. Read, write & execute simple Python programs.
3. Read and write data from/to files in Python Programs.
4. Represent compound data using Python lists, tuples, and dictionaries.
5. Decompose a Python program into functions.
6. Learn the object-oriented concepts.

Course Content:

UNIT- I **12 Hrs**

Introduction to Python, Installing Python, Expression and values, Variable, Keywords, Basic operators. Conditional Statements, Looping, Control statements, Arrays

UNIT II **12 Hrs**

Strings and Functions: A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, String Methods, in Operator, String Operations. Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Directories Expressions: Concept of regular expression, various types of regular expressions, using match function.

UNIT III **12 Hrs**

List: Values and Accessing Elements, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, Built-in List functions and methods. Dictionaries: Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods. Tuples: Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions. Exceptions: Built-in Exceptions, Handling Exceptions, Exception with Arguments, User-defined Exceptions Regular

UNIT IV **12 Hrs**

Files: Text Files, The File Object Attributes, Classes and Objects: Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding.

Text Books:

1. Wesley J. Chun, “Core Python Applications Programming”, 3rd Edition, Pearson Education, 2016
2. Charles Dierbach, “Introduction to Computer Science using Python”, Wiley, 2015
3. Downey, A. et al., "How to think like a Computer Scientist: Learning with Python", John Wiley, 2015

Reference Books:

1. Mark Lutz, “Learning Python”, 5th edition, Orelly Publication, 2013,

2. John Zelle, “Python Programming: An Introduction to Computer Science”, Second edition, Course Technology Cengage Learning Publications, 2013,
3. Michel Dawson, “Python Programming for Absolute Beginers” , Third Edition, Course Technology Cengage Learning Publications, 2013,

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0201	CO1	-	-	2	2	3	3	2	2	-	2
	CO2	-	-	2	2	2	3	2	2	-	2
	CO3	-	-	2	3	2	3	2	2	-	2
	CO4	-	-	2	3	2	3	2	2	-	2

Course Code	Physics of Clouds	Type	L	T	P	C	Hrs/Week
B21PHS211		SC	3	0	0	3	4

Course objectives:

This course aims to provide for the students:

1. To understand the composition, formation, classification of clouds based on atmospheric thermodynamics.
2. To understand the growth rate, evaporation of droplet by Bergeron process.
3. To understand the role of Collisions and Coalescences process in the droplet growth.
4. To understand the phenomenon of Cloud electrification, precipitation and seeding.

Course Outcomes:

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

1. Describe the process of formation of clouds.
2. Explain the nucleation and growth of cloud particles.
3. Compare different mechanisms of droplet growth.
4. Explain the electrical phenomenon related to lightening.

Course Contents:

Unit-I: Fundamental Concepts

Clouds: Introduction, Definition, identification, classification, altitude and composition.

Atmospheric thermodynamics: Vapor pressure, Clauius-Clapeyron equation, saturation vapor pressure, ways for reaching saturation and mechanisms for cooling the air.

Fundamental concepts of Cloud: Liquid water content, parameters of macroscale cloud, cloud drop size distribution, actual drop size distribution.

Unit-II:

Formation of Cloud droplets: General aspects, saturation vapor pressure over a curved droplet, saturation vapor pressure over a solution, combining the curvature and solute effect, atmospheric aerosols, cloud condensation nuclei.

Droplet Growth by Diffusion: growth of an individual droplet by diffusion of water vapor, growth rate in term of mass or radius, other questions needed to solve for growth rate, evaporation of droplet, Bergeron process.

Unit-III:

Roplet growth by Collisions and Coalescences: Droplet terminal fall speed, growth due to collection smaller, uniform droplet, collision efficiency, growth equation in terms of radius, growth due to collision with smaller droplets of non-uniform size.

Growth of Ice Crystals: Formation of ice crystals, diffusional growth of ice crystals branching versus faceting, collision-coalescence versus the Bergeron process.

Unit-IV:

Precipitation: Types of precipitation, rainfall rate and drop-size distribution. The Marshall-Palmer drop-size distribution.

Weather Modification: Examples of experiments, cloud seeding, methodology.

Cloud Electrification: Lightning, electrical properties of the fair-weather atmosphere, electrical properties of a thunderstorm, Benjamin Franklin's famous kite experiment, cloud-to-ground lightning, Intra-cloud lightning, other forms of lightning, thunder, lightning rods, lightning safety.

Suggested Textbooks and References:

1. R. R. Rogers, A Short Course in Cloud Physics.
2. B. J. Mason, The Physics of Clouds.
2. H. R. Fletcher and Klett, Microphysics of Clouds and Precipitation.
3. Lectures on atmospheric thermodynamics.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PHS211	CO1	3	3	2	2	1				3	3
	CO2	3	3	2	1	1				3	3
	CO3	3	3	2	1	1				3	3
	CO4	3	3	2		1				3	3

Course Code	Renewable Energy Resource	Type	L	T	P	C	Hrs/Week
B21PHS212		SC	3	0	0	3	4

Course objectives:

This course aims to provide for the students:

1. To understand the various forms of conventional energy resources.
2. To learn the present energy scenario and the need for energy conservation
3. To outline division aspects and utilization of renewable energy sources for both domestics and industrial application.
4. To analyze the environmental aspects of renewable energy resources.

Course Outcomes:

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

1. Compare the prospects of solar, wind, and bio energy systems.
2. Discuss the latest developments of solar energy resources and its utilization.
3. Estimation of wind energy for energy generation.
4. Describe the applications of solar energy.

Course Contents:

Unit -1

Solar energy: Basic ideas- Origin, Spectral distribution of solar radiation, Attenuation of beam radiation, Basic earth solar angle and derived solar angle, GMT, LCT, LST, Day length, Estimation of average solar radiation, sunshine recorder. Numerical problems.

Unit -2

Solar collectors: Principle of conversion of solar energy into heat, classification of solar collectors, Flat plate and concentrating collectors, construction, Thermal efficiency and coating, Heat losses, Solar cell and its efficiency, PV Panels. Numerical problems.

Photothermal devices: Solar cooker, Solar dryer, solar hot water system - principles and working.

Unit -3

Photovoltaic systems: Solar lantern, water pumps and streetlights - principles and working.

Wind energy: Origin, estimation of energy obtainable from wind, velocity and power duration curves, energy, pattern factors. Theory of power - Momentum transfer, power coefficients, principle of wind turbine, power vs velocity characteristics of wind turbine generator, cut in speed and cut out speed. Numerical problems.

Unit -4

Wind driven machines: Characteristics of wind turbine; Types - Horizontal and vertical axis types, vertical axis darrieus rotor wind turbine, Horizontal axis propeller type - twin blade and three blades. Blade pitch control. Advantages and disadvantages of two blade and three blade systems. Numerical problems.

Suggested Textbooks and References:

1. Rai G D, Non-Conventional Energy Sources, 4th Edn., Khanna Publishers (2009).
2. Aarwal M P, Solar Energy, S Chand, and Co. (1985).
3. Sukhatme S P, Nayak J K, Solar Energy, 3rd Edn., Tata McGraw-Hill (2008).
4. Boyle G, Renewable Energy, Power for a Sustainable Future, 2nd Edn., Oxford University Press (2004).
5. Jayakumar P, Resource Assessment Handbook, APCTT (2009).
6. Balfour J, Shaw M, and Jarosek S, Introduction to Photovoltaics, Jones and Bartlett Learning (2013).

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PHS212	CO1	3	3	2						2	
	CO2	3	3	2						3	
	CO3	3	3	1						3	
	CO4	3	3	2						3	

Course Code		Type	L	T	P	C	Hrs/Week
B21ASM213	**Lasers and Fibre Optics**	SC	3	0	0	3	4

Course objectives:

This course aims to provide for the students:

1. To develop knowledge about lasers and laser amplifiers used in Industry and research
2. To explain the basic laser radiation properties and switching mechanism
4. To demonstrate different technics of light modulation
5. To analyse and apply the knowledge of optoelectronic devices in research

Course Outcomes:

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

1. Get knowledge of principle, mechanism, and applications of LASERs.
2. Understand and demonstrate LASER -matter interaction and effects.
3. Illustrate non-linear optical properties and to gain knowledge of electro, acousto and magneto-optic effects.
4. Apply optics and physics of materials knowledge in demonstrating optoelectronic devices.

Course Contents:

Unit-I:

Laser basics: Coherence properties of laser light, temporal coherence, monochromaticity, spatial coherence, directionality, line width, brightness, divergence, line shape broadening, focusing properties of laser radiation, laser modes - axial and transverse, mode selection, single mode operation, selection of laser emission line.

Laser oscillator: Pumping schemes, Gain - threshold conditions; Optical resonators.

Unit-II:

Types of lasers: Construction and principles of working of Nd-YAG, CO2 and dye lasers and semiconductor lasers.

Laser diodes: Lasing conditions and gain in a semiconductor, selective amplification and coherence, Materials for laser diodes, quantum well lasers, surface emitting lasers, characterization, and modulation of lasers.

Unit-III:

Fibre optics and dielectric wave guides: Wave Guide- Slab wave guide, Modes, V number, Modal material and waveguide dispersions, Numerical problems.

Optical fibre: Types, functions, light propagation, optical power, velocity of propagation, critical angle, acceptance angle, numerical aperture, mode of propagation. Numerical problems.

Unit-IV:

Index profile: Single mode step-index optical fibre, multimode step-index fibre, graded index fibre; advantages and disadvantages. Numerical problems.

Energy losses in optical fibre: Bit rate, dispersion optical fibre communication, and optical bandwidth, Absorption, and scattering, optocoupler.

Suggested Textbooks and References:

1. Wilson J, and Hawkes J, Optoelectronics: An Introduction, 3rd Edn., PrenticeHall (1998).
2. Singh J, Optoelectronics: An Introduction to Materials and Devices, McGraw-Hill (1996).
3. Bhattacharya P, Semiconductor Optoelectronic Devices, Prentice Hall International (1997).

4. Nambiar K R, Lasers: Principles, Types and Applications, New Age International Publisher (2004).
6. Tomasi W, Electronic Communication Systems, 5th Edn., Pearson Education (2008).
7. Roddy D, and Coolen J, Electronic Communication, 4th Edn., Pearson Education (2008).

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21ASM213	**CO1**	3	3							2	
	CO2	3	2							3	
	CO3	3	2							3	
	CO4	3	3							3	

Course Code	Environmental Studies	Type	L	T	P	C	Hrs/Week
B21ASM201		MC	0	0	0	0	2

Course Objectives:

This course aims to provide for the students:

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:

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

1. Adapt the environmental conditions and protect it
2. Estimate the role of individual, government and NGO in environmental protection.
3. Interpret the new renewable energy resources with high efficiency through active research.
4. Analyze the ecological imbalances and protect it.

Course Contents:

Unit-I

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

Unit-II

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 wastewater 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 natural disasters.

Unit-III

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

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. R.J. Ranjit Daniels and J. Krishnaswamy, Environmental Studies, by (2017),

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

Mapping of Course Outcomes with programme Outcomes

Course Code	**POs/ COs**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**
B21ASM201	**CO1**	1	2	1	1	1	2	3	1	1	1
	CO2	1	3	1	1	1	3	3	1	1	1
	CO3	2	3	2	1	3	3	3	1	1	1
	CO4	1	2	1	1	1	2	3	1	1	1

Course Code	**Mathematics Practicals-II**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21MT0202		HC	0	0	1.5	1.5	3

Course Objectives:

This course aims to provide for the students:

1. Obtain skill in creating simple programs using *Scilab* and *Maxima*.
2. Acquire skill in tracing standard curves using *Maxima*.
3. Gain proficiency in using *Maxima* to solve problems on Differentiation and Euler‟s theorem and its extension.

Course Outcomes:

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

1. Acquire proficiency in using *Scilab* to find identity and inverse element of a group and in construction of Caley –Table.
2. Demonstrate the use of *Maxima* to understand and interpret the various types of functions from the algebraic and graphical points of view.
3. Sketch graphs of standard curves using *Maxima* to interpret tracing of curves.
4. Be familiar with the built-in functions to find derivatives of any order and solve application problems dealing with the concept of partial derivatives.

Course Contents:

List of Programmes

1. Verifying whether given operator is binary or not.
2. To find identity and inverse element of a group.
3. Verification of normality of a given subgroup.
4. Illustrating homomorphism and isomorphism of groups.
5. Examples for finding right and left coset and the index of a group.
6. Examples to verify Lagrange‟s theorem.
7. Plotting of standard Cartesian curves.

8. Plotting of standard Cartesian curves.
9. Plotting of standard polar curves.
10. Plotting of standard parametric curves.
11. Solution of second and higher order ordinary differential equations with constantcoefficients.
12. Solution of second order ordinary differential equations with variable coefficients
    i) Method of variation of parameters
    ii) When the equation is exact

Suggested Textbooks and References:

1. Farukh Khalilov and Tayyip oral, Math coding Python, 5th Edition, USA-2020.
2. Joakim Sundnes, Introduction to Scientific programming with Python, 2nd Edition, Springer 2010.
3. Allen Downey and Jeffrey Elkner, Learning with Python, 5th Edition, Springer, 2015.
4. Eric Matthes, A Hands-On, Project-Based Introduction to Programming- Python Crash Course, 2nd Edition:
5. Al Sweigart, Automate The Boring Stuff With Python: Practical Programming For Total Beginners, 2nd Edition.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0202	**CO1**	3	2	2				1	1	3	3
	CO2	3	2	2	1			1	1	3	3
	CO3	2	2	2	1			1	1	3	3
	CO4	3	2	2				1	1	3	3

Course Code	Physics Practicals-II	Type	L	T	P	C	Hrs/Week
B21PH0202		HC	0	0	1.5	1.5	3

Course Objectives:

This course aims to provide for the students:

1. Impart knowledge about various laws of thermodynamics through experiments
2. Familiarise with the concepts of thermal conductivity through experiments
3. Familiarise with various experiments in thermodynamics and mechanics Lab
4. Enable to understand physical constant through experiments

Course Outcomes:

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

1. Verify various laws of thermodynamics through experiments
2. Analyse the concepts of thermal conductivity through experiments
3. Demonstrate the various experiments in thermodynamics and mechanics Lab
4. Determination of physical constant through experiments

Course Contents:

Any **Eight** of the Following Experiments

1. Determination of Specific heat of a liquid by cooling – graphical method.

2. Determination of thermal conductivity of a bad conductor by Lee-Charlton method.
3. Verification of Stefan – Boltzmann law by using Ohm‟s law.
4. Determination of boiling point of a liquid using platinum resistance thermometer.
5. Determination of moment of inertia of irregular body using Torsional pendulum.
6. Determination of rigidity modulus by the static torsion method.
7. Determination of the acceleration due to gravity using Spiral spring (graphical method).
8. Determination of wavelength of a given LASER by diffraction method.
9. Verification of Gaussian distribution law and calculation of standard deviation –Monte Carlo experiment.
10. Determination of speed of the transverse waves over the sonometer wire (Study of stationary wave on a stretched string).

Reference Books:

1. B Saraf etc., - Physics through experiments, Vikas Publications, 2013.
2. D P Khandelwal –A Laboratory Manual of Physics for Undergraduate Classes, Vikas Publications First ed (1985)
3. Advanced Practical Physics for Students – Worsnop & Flint, Methuen & Co, London, 1923.
4. An Advanced Course in Practical Physics, D Chattopadhyay, P C Rakshit, B Saha, New Central Book Agency (P) Limited, Kolkata, Sixth Revised Edition, 2002.
5. BSC, Practical Physics, CL Arora, S. Chand & Co, New Delhi, Revised Edition, 2007.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0202	CO1	3	2	2		1				3	3
	CO2	3	2	2	1	1				3	3
	CO3	2	2	2	2	2				3	3
	CO4	3	2	2		1				3	3

Course Code	Programming in Python - LAB	Type	L	T	P	C	Hrs/Week
B21CP0202		HC	0	0	1.5	1.5	3

Course Objectives:

1. Basic programming knowledge.
2. Minimum knowledge of installing softwares.

Course Outcomes:

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using python lists, Dictionaries.
5. To Write programs on files to read data from files.

Course Contents:

PART A

1. Write a python program to demonstrate basic data type in python.

2. Write a python program to find factorial of a number.
3. Write a python program to check whether the number is prime or not.
4. Write a python program to find the largest number in each array.
5. Write a Python program to swap first and last element of the list.
6. Write a Python program to check if a string is palindrome or not.
7. Write a python program to sort list of dictionaries by values– Using itemgetter.
8. Write a Python program to read file word by word.

PART B

During practical examination, the External and Internal examiners may prepare exam question paper related to theory syllabus apart from Part-A. (A minimum of 6 Programs has to be prepared).

Mapping of Course Outcomes with programme Outcomes

Course Code	**POs/ COs**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**
B21CP0202	**CO1**	-	-	2	2	3	3	2	2	-	-
	CO2	-	-	2	2	2	3	2	2	-	-
	CO3	-	-	2	3	2	3	2	2	-	-
	CO4	-	-	2	3	2	3	2	2	-	-

THIRD SEMESTER

Course Code	**Language – II: Kannada- III**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21AHK301		FC	1	1	0	2	3

Course Objectives:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೂರನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯ ಪ್ರಕಾರಗಳಾದ
ನವೋದಯ, ನವ್ಯ ಕಾವ್ಯ, ಸಣ್ಣಕಥೆಗಳು ಹಾಗು ನಾಟಕ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

1. ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
2. ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಮೂಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.
3. ಅವರಲ್ಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಭಾಷೆ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ

4. ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

Course Outcomes:

ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯ ಪ್ರಕಾರಗಳಾದ ನವೋದಯ, ನವ್ಯ ಕಾವ್ಯ, ಸಣ್ಣಕಥೆಗಳು ಹಾಗು ನಾಟಕ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟ ಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

1. ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
2. ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
3. ಸಾಮಾಜಿಕ ಅರಿವು ಮೂಡಿಸುತ್ತದೆ
4. ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.

Course Contents:

ಗಚಿಱ ಖ ನವೋದಯ ಕವಿತೆಗಳು
7 ೃಡಿ

1. ಬೆಳಗು	ದ.ರಾ. ಬೇಂದ್ರೆ
2. ಕಲ್ಕಿ	ಕುವೆಂಪು
3. ಕನ್ನಡ್ ಪದಗೊಳ್	ಜಿ. ಪಿ. ರಾಜರತ್ನಂ

ಗಚಿಱ ಖಖ ನವೋದಯ ಹಾಗು ನವ್ಯ ಕವಿತೆಗಳು 7 ೃಡಿ

1. ಅವಧೂತ	ಸು.ರಂ.ಎಕ್ಕುಂಡಿ
2. ಮನೆಯಿಂದ ಮನೆಗೆ	ಕೆ.ಎಸ್.ನ
3. ನನ್ನ ಹಣತೆ	ಜಿ.ಎಸ್.ಎಸ್.

ಗಚಿಱ ಖಖಖ ಸಣ್ಣ ಕಥೆಗಳು 6 ೃಡಿ

1. ದಾಳಿ ನಡೆದಾವ ಅಣ್ಣಾ	ಮರೇಶ ನುಗಡೋಣಿ
2. ಕೊನೆಯ ಗಿರಾಕಿ	ನಿರಂಜನ
3. ಮಾನೀಟರ್	ತೇಜಸ್ವಿ

ಗಚಿಱ ಖಗಿ ನಾಟಕ 6 ೃಡಿ

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

ಖಾಯಾಜಾಜಸ ಖಿಜಷಾ ಃಊಞ್ಚ ಚಿಟಿಜ ಖಜಾಸಿಜಾತಿಜಾಟಿಛಿಜ

1. ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸೀಮಾತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
3. ಡಾ. ಅರವಿಂದ ಮಾಲಗತ್ತಿ, ಸಾಹಿತ್ಯ ಸಂಸ್ಕೃತಿ ಮತ್ತು ದಲಿತ ಪ್ರಜ್ಞೆ, ಪ್ರಕಾಶಕರು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2014
4. ಡಾ. ಈ.ಎಸ್. ಆಮೂರ, ಕನ್ನಡ ಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
5. ಕೀರ್ತನಾಥ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಟ್ರಸ್ಟ್, ಧಾರವಾಡ. 2009

6. ಸಂ. ಬಿ.ಎಸ್. ಕೇಶವರಾವ್. ಕೈಲಾಸಂ ಕನ್ನಡ ನಾಟಕಗಳು, ಪ್ರಕಾಶಕರು ಅಂಕಿತ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2005
7. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು -2014
8. ಆಧುನಿಕ ಕನ್ನಡ ಕಾವ್ಯ ಭಾಗ-2, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ,ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2004
9. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

Mapping of Course Outcomes with programme Outcomes

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

Course Code	Language – II: Hindi - III	Type	L	T	P	C	Hrs/Week
B21AHH301		FC	1	1	0	2	3

Course Objectives:

This course aims to provide for the students:

1. संदर्भुसभर उचित र्भषभ कभ प्रयोग करने की दक्षतभ को छभत्रों में उत्पन्न करनभ |
2. सभचहत्य के मभध्यम से समभज एवं मभनवीय मूल्ों की समझभकर, उन मूल्ों की रक्षभ हेतु प्रेरर करनभ |
3. छभत्रों में पुस्तक पठन एवं लेखन की अकृ चतम प्रवृचि स्थभचपत करनभ |
4. अध्येतभओं में सभचहत्य के मभध्यम से प्रर्भवी एवं कु शल संि भर कभ चवकभस करनभ |

Course Outcomes:

अध्ययन की समभप्ति पर अध्येतभ –

1. सभमभचजक मूल् एवं नैचतक जवभबदेही को स्वीकभर कर सकतभ है |
2. सभचहत्य की प्रभसंचगकतभ को जीवन में समझने की दक्षतभ रखतभ है |
3. समभज में अंतचनचहत पद्दचतयभँएवं चविभरधभरभओं कभ व्यभख्यभन करने में सक्षम बन सकतभ है |
4. सभचहत्य के मभध्यम से प्रर्भवी एवं कु शल संि भर कभ चवकभस कर सकतभ है |

Course Contents:

इकाई – 1: नभिक : द्रोणभिभयाऔर एक – ि ॉ. शंकर शेष **7 hrs**
लेखक पररिय
प्रथम दृश्य
चितीय दृश्य

एक

इकाई – 2: नभिक : द्रोणभिभयाऔर

7 hrs

तृतीय दृश्य
ितुथा दृश्य

इकाई – 3: नभिक : द्रोणभिभया और एक **6 hrs**
पंिम
दृश्य छठभ
दृश्य

इकाई – 4: **6 hrs**

अनुवाद : अग्रेजी - चहन्दी-समािार
पत्र सबध सहन्दी -अग्रेजी -
समािार पत्र सबध

सूचना: प्रत्ये इ ाई 25 अ चलप्र चनधारि त है |

Text book/s: पाठ्य पुस्तक

1. प्र और द्रोणाियाि- डॉ. श र शेष

References: सन्दर्ग्रन्थ

1. एक और द्रोणभिभया- िॉ. शंकर शेष
2. मीचियभ लेखन एवं जनसंिभर – िॉ.संजीव कु मभर
3. चहन्दी सभचहत्य कभ इचतहभस - िॉ. नभगेन्द्र
4. आधुचनक चहन्दी सभचहत्य कभ इचतहभस - िॉ. बच्चन चसंह
5. चहन्दी सभचहत्य कभ नवीन इचतहभस - िॉ. लभल सभहब चसंह
6. शुद्ध चहन्दी कै से बोले कै से चलखे- पृथ्वीनभथ पभण्डे
7. कभयभालय अनुवभद चनदेचशकभ
8. मीचियभ चवमशा- रभमशरण जोशी
9. संस्कृ चत, जनसंिभर और बभजभर – नन्द रिभज

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21AHH301	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			

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

This course aims to provide for the students:

Course Objectives:

1. To outline the global and local concerns of gender and identity.
2. To identify the complexities of human emotions through literature.
3. To assess the struggles of human survival throughout history.
4. To compare and contrast between the various dimensions of childhood.

Course Outcomes:

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

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

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:

1. Sexton, Anne. *The Complete Poems*. Houghton Mifflin, 1999.
2. Namjoshi, Suniti. *Feminist Fables*. Spinifex Press, 1998.
3. Vanita, Ruth &Saleem Kidwai (ed.) *Same Sex Love in India*. Penguin India, 2008.
4. Gilman, Charlotte Perkins. *The Yellow Wallpaper*. Rockland Press, 2017.
5. Gale, Cengage Learning. *A Study Guide for Alfred Noyes's "The Highwayman"*. Gale, Study Guides, 2017. (Kindle Edition Available)
6. Shakespeare, William. *Poems and Sonnets of William Shakespeare*. Cosimo Classics, 2007.
7. Stockton, Frank Richard. *The Lady, or the Tiger?* Create space Independent Publications, 2017.
8. Wilde, Oscar. *The Collected Works of Oscar Wilde*. Wordsworth Editions Ltd., 1997.
9. Tennyson, Lord Alfred. *The Complete Works of Alfred Tennyson*. Forgotten Books, 2017.
10. Blake, William Erdman, David V. (ed.). The Complete Poetry and Prose (Newly revised ed.). Anchor Books, (1988).
11. Maupassant, Guy de. *Guy de Maupassant-The Complete Short Stories*. Projapati, 2015.

Mapping of Course Outcomes with programme Outcomes

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

B21AHA301	**CO1**					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

Course Code	**Mathematics-III**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21MT0301		HC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students to:

1. Apply and und erstand limit of a sequence.
2. Demonstrate the convergence or divergence of sequences and standard series.
3. Prove the tests for convergence: Comparison Test, Ratio Test, Cauchy‟s Root test, Raabe‟s Test, Alternating Series Test etc.
4. familiarize with vector calculus.
5. Formation and solving of a partial differential equation.

Course Outcomes:

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

1. Quote and understand the definition of a limit of a sequence or a function in its various forms
2. Demonstrate the convergence or divergence of the geometric and harmonic series and other standard series.
3. Interpret physically vector differentiation applied to both scalar and vector functions. Apply suitable method to solve partial differential equations and to solve non-linear partial differential equations.

Course Content:

Unit-I:

Sequences and Series-I: Sequence of real numbers – Bounded and unbounded sequences – Limit of a sequence – Sum, product and quotient of limits – Standard theorems on limits – Convergent, divergent and oscillatory sequences – Standard properties – Monotonic sequences and their properties – Cauchy‟s general principle of convergence.

Unit-II:

Sequences and Series-II: Infinite series of real numbers – Convergence and Divergence - Properties of convergence – Series of positive terms – Geometric series – p – series – Comparison tests – D‟ Alembert‟s ratio test – Raabe‟s test – Cauchy‟s root test – alternating series Leibnitz‟s test.

Unit-III:

Vector Calculus: Scalar field – gradient of a scalar field, geometrical meaning – directional derivative – Maximum directional derivative – Angle between two surfaces - vector field – divergence and curl of a vector field – solenoidal and irrotational fields – scalar and vector potentials – Laplacian of a scalar field – vector identities. Standard properties, Harmonic functions, Problems.

Unit-IV:

Partial differential Equations: Formation of a partial differential equations by elimination of arbitrary constants and functions – Solution of partial differential equations – Solution by Direct integration, Lagrange‟s linear equations of the form $Pp + Qq = R$, Standard types of first order non-linear partial differential equations – Charpit‟s method.

Text Books:

1) S. C. Malik and Savita Arora, Mathematical Analysis, 2nd ed. New Delhi, India: New Age international (P) Ltd., 1992.
2) Shanthi Narayan and P K Mittal, Differential Calculus, Reprint. New Delhi: SChand and Co. Pvt. Ltd., 2014.
3) G K Ranganath, Text book of B.Sc., Mathematics, Revised ed. New Delhi, India: S Chand and Co., 2011
4) M D Raisinghania, Ordinary and Partial Differential Equations, S Chand and Co. Pvt. Ltd., 2014.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/ COs	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0301	CO1	3	3	3	3			1	3	3	3
	CO2	3	2	1	2			1	2	3	3
	CO3	3	2	2	2			1	2	3	3
	CO4	3	3	3	3			1	3	3	3

Course Code	Optics and Spectroscopy	Type	L	T	P	C	Hrs/Week
B21PH0301		HC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. To understand progressive and simple harmonic wave motions and the mathematical equations that govern them.
2. To understand superposition of simple harmonic wave motions and the phenomenon related to them.
3. To study the theory of light and the basic design principles of optical instruments.
4. To analyse and explain interference, diffraction and polarization of light.

Course Outcomes:

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

1. Explain the phenomenon related to simple harmonic motion waves.
2. Explain the laws of reflection and refraction based on Huygen‟s principle.
3. Describe the working of optical instruments based on different types of lens.
4. Differentiate between interference, diffraction and polarization.

Course Contents:

UNIT-I

Interference: Concept of coherent sources. Interference by division of wave Front-Theory of Fresnel's biprism, Interference by division of amplitude-thin films of uniform thickness, antireflective coatings, Newton's rings, Interference at a wedge, Michelson's interferometer-Measurement of λ and dλ. Numerical problems.

Diffraction: Fresnel and Fraunhofer diffraction, Explanation of rectilinear propagation of light. Theory of the zone plate, Comparison with a convex lens, Fresnel diffraction at a straight edge, Fraunhofer diffraction at a single slit.

Transmission grating - theory for the case of normal incidence, resolving power and dispersive power of plane grating. Numerical problems.

UNIT-II

Polarization: Double refraction in uniaxial crystals, Huygen's theory, Positive and negative crystal, Principal refractive indices, Huygen's constructions of O and E wave fronts in a uniaxial crystal (i) optic axis in the plane of incidence and parallel to the crystal surface at normal incidence, (ii) optic axis in the plane of incidence and perpendicular to the crystal surface at normal incidence, Retarding plates, Production and analysis of linearly, Circularly, and elliptically polarized light, Optical activity, Fresnel's theory, Rotatory polarization. calculation of fringe width. Numerical problems.

UNIT-III

Atomic Spectra: A qualitative account of Sommerfeld relativistic atom model. Excitation and Ionization potentials - Franck-Hertz experiment. Vector model of atom. Electron spin. Space quantization. Magnetic moment of an electron due to its orbital motion. Stern-Gerlach experiment. Spin-orbit interaction and the fine structure of spectral lines. Quantum number and selection rules. Pauli's exclusion principle. Electronic configuration of atoms. Valance electron. Numerical problems.

Zeeman effect: Normal and anomalous effects, Experimental details of normal Zeeman effect, explanation of normal Zeeman effect based on classical model, expression for the Zeeman shift. Numerical problems.

UNIT-IV

Molecular spectra and The Raman effect: Rotation, vibration and electronic spectra of molecules, associated quantum numbers and selection rules, Theory of pure rotation spectra. Theory of rotational-vibrational spectra. Raman effect - Salient features, experimental setup to study Raman effect, Quantum Theory of Raman effect; Intensity and polarization of Raman lines; Applications. Fluorescence and phosphorescence. Numerical problems.

Lasers: Properties, Metastable state, Spontaneous emission, stimulated emission, population inversion. Three level lasers. The CO_2 laser, Semiconductor laser. Laser applications: medical, communications, and industrial applications. Numerical problems.

Suggested Textbooks:

1. Bhattacharya A B, and Bhattacharya R, Undergraduate Physics, Vol. 2, New Central Book Agency (2008).
2. Subrahmanyam N, Brij Lal, and Avadhanulu. M N, A Textbook of Optics, 24th Revised Edn., S Chand and Company (2015).
3. Satya Prakash, Optics and Atomic Physics, 8th Revised Edn., Ratan Prakashan Mandir (1988).
4. Ashok Kumar, Khanna D R, and Gulati H.R, Fundamentals of Optics, 15th Edn., R Chand, Publishers (2011).

5. Murugeshan R, Kiruthiga Sivaprasath, Optics and Spectroscopy, 17th Revised Edn., S Chand and Company (2011).
6. Jenkins F A, and White H E, Optics, 3rd Edn., McGraw-Hill (1957).

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0301	**CO1**	3	3	3						3	
	CO2	3	3	3						3	
	CO3	3	2	2						3	
	CO4	3	3	2						3	

Course Code	Relational Data Base Management Systems	Type	L	T	P	C	Hrs/Week
B21CP0301		HC	3	0	0	3	4

Course Objectives:

1. Learn and practice data modelling using the entity-relationship and developing database designs.
2. Design and implement a database schema for a given problem-domain
3. Apply normalization techniques to normalize the database
4. Understand the use of Structured Query Language (SQL) and learn SQL syntax.

Course Outcomes:

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

1. Describe the fundamental elements of relational database management systems
2. Explain the basic concepts of relational data model, entity-relationship model, relational Database design, relational algebra, and SQL.
3. Design ER-models to represent simple database application scenarios
4. Convert the ER-model to relational tables, populate relational database and formulate SQL Queries on data.
5. Improve the database design by normalization.

Course Contents:

UNIT – I: 12 Hrs

BASIC CONCEPTS: Database Management System - Characteristics of the Database Approach - Different people behind DBMS- Advantages of DBMS over file-based system - Three level architecture of DBMS or logical DBMS architecture - Physical DBMS Architecture - Database Administrator (DBA) Functions & Role - Types of Database. The database system Environment, Classification of DBMS.

UNIT - II: 12 Hrs

RELATIONAL, ER MODELS AND NORMALIZATION: Data Models - Relational Model – Domains - Tuple and Relation - Super keys - Candidate keys - Primary keys and foreign key for the Relations - Relational Constraints - Domain Constraint - Key Constraint - Integrity Constraint - Entity Relationship (ER) Model – Entities – Attributes – Relationships - Defining Relationship for College Database - E-R Diagram - Conversion of E-R Diagram to Relational

Database. Functional Dependencies and Normalization for Relational Database: Informal Design Guidelines for Relational schemas, Functional Dependencies, First Normal Form, Second Normal form, Third Normal form, Boyce-Codd Normal Form.

UNIT - III: **12 Hrs**

RELATIONAL ALGEBRA OPERATIONS: Union, Intersection, Difference, Cartesian product, Selection, Projection, Join, Division, Additional Relational Operations.

STRUCTURES QUERY LANGUAGE (SQL): Meaning – SQL commands - Data Definition Language - Data Manipulation Language - Data Control Language - Transaction Control Language - Queries using Order by – Where –Group by-Nested Queries. Aggregate functions in SQL.

UNIT – IV: **12 Hrs**

DISTRIBUTED AND CLIENT SERVER DATABASES: Need for Distributed Database Systems - Structure of Distributed Database - Advantages and Disadvantages of DDBMS - Advantages of Data Distribution - Disadvantages of Data Distribution - Data Replication - Data Fragmentation. Client Server Databases: Emergence of Client Server Architecture - Need for Client Server Computing - Structure of Client Server Systems & its advantages.

PL/SQL Introduction, Language fundamentals, conditional and sequential control, Iterative Processing and loops.

Textbooks:

1) RemezElmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, 5th Edition, Pearson Education, 2007.
2) .Abrahamsi. Silberschatz, Henry. F. Korth, S. Sudarshan, “Database System Concepts” 6th Edition, McGraw Hill, 2012.

Reference Books

1) Database Management System: R.Ramakrishnan & J.Gehrke, McGraw Hill.

2) Modern Database Management: J.A.Hoffer,V.Rames &H.Topi, Pearson.

3) Database System Concepts: Silberschatz, Korth & Sudarshan, McGraw Hill.

4). Krishna P. Radha, Das Gupta Pranab Kumar, “Database Management System Oracle SQL and PL/SQL” Prentice-Hall of India Pvt. Ltd, 2013.

Mapping of Course Outcomes with Programme Outcomes

Course Code	**POs/ COs**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**
B21CP0301	CO1	3	3	3	2	0	0	0	3	2	3
	CO2	3	3	2	2	0	0	2	2	3	2
	CO3	3	3	2	2	0	0	2		3	3
	CO4	3	3	3	2	0	0	0	3	2	3

Course Code	**Data Communication and Networks**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21CPS311		SC	3	0	0	3	4

Course Objectives:

1. Outline the theory behind the basic design of networks and approaches to design networks.
2. Get the idea of representation of digital information and digital transmission and could able to understand and design reliable transmission.
3. Able to determine type of transmission and technology required for transmission.
4. Outline the theory behind the various protocol used in transmission and could design new protocols.

Course Outcomes:

1. Explain the basics of networking, Network Models.
2. Identify the data & signals, the channel rate and conversion techniques, the error detection and correction techniques.
3. Demonstrate handling of multiple channels and transmission.
4. Determine how to transmit data over the channels reliably.

Course Contents:

UNIT – I

INTRODUCTION: 12 Hrs

Data Communications: Components, Representations, Data Flow, Networks: Physical Structures, Network Types: LAN, WAN, Switching, Internet. Network Models: Protocol Layering: Scenarios, Principles, Logical Connections, TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP suite, Description of layers, Multiplexing and Demultiplexing, The OSI Model: OSI Versus TCP/IP.

UNIT – II 12 Hrs

Physical layer: Analog and digital, Analog signals, Digital signals, Analog versus digital, Data rate limit, Transmission impairments, Line coding, Block coding, Sampling, Transmissionmode, Modulation of digital data, Telephone modems, Modulation of analog signal, FDM, WDM, TDM, Guided media, Unguided media, Circuit switching, Telephone networks, DSL technology, Cable modem, SONET.

UNIT – III 12 Hrs

Data link layer: Types of errors, Detection, Error correction, Flow and error control, Stop and wait ARQ, go back n ARQ, Selective repeat ARQ, HDLC, point to point protocol, PPP stack, Random access, Controlled access, Channelization, Traditional Ethernet, Fast Ethernet, Gigabit Ethernet, IEEE802.11, Bluetooth, Connecting devices, Backbone network, Virtual LAN, Cellular telephony, Satellite networks.

UNIT – IV 12 Hrs

Network layer: Internetworks, Addressing, Routing, ARP, IP, ICMP, IPV6.
Transport layer: User datagram protocol (UDP), Transmission control protocol (TCP).
Application layer: Name space, Domain name space, Distribution of name space, DNS in the internet, Electronic mail, File transfer, HTTP, World wide web (WWW), Digitizing audio and video, Audio and video compression, Streaming stored audio/video, Streaming live audio/video, Real time interactive audio/video, Voice over IP.

Textbooks:

1. Ferouzan, Behrouz A., Data Communications and Networking, TATA McGraw Hill (2002) 2nd ed.
2. Stallings William, Data and Computer Communication, Pearson Education (2000) 7th ed.

Reference Books:
1. Black, Ulylers D., Data Communication and Distributed Networks, PHI (1999) 3rded.
2. Tanenbaum, Andrew S., Computer Networks, PHI (2000) 2nd ed.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CPS311	**CO1**	3	3	2	3	2	1	1	2	2	2
	CO2	3	2	2	2	2	1	1	1	2	2
	CO3	3	3	2	2	2	1	1	2	2	2
	CO4	3	3	3	3	2	1	1	2	2	2

Course Code	Multimedia Computing	Type	L	T	P	C	Hrs/Week
B21CPS312		SC	3	0	0	3	4

Course Objectives:

1. To provide knowledge on different concept of multimedia
2. To understand the different data formats
3. To know the applications of multimedia in different fields

Course Outcomes:

1. Understand the concept of Multimedia Technology.
2. Learn the concepts of various digital media.
3. Know the fundamentals of data compression.
4. Understand the distributed multimedia system.

Course Contents:

UNIT-I

Introduction, Media, and Audio Technology **9 Hrs**

Multimedia Elements; Multimedia Applications; Multimedia Systems Architecture, Evolving Technologies for Multimedia Systems; Defining Objects for Multimedia Systems; Multimedia Data Interface Standards; The need for Data Compression; Multimedia Databases. Media: Perception Media, Representation Media, Presentation Media, Storage Media, Transmission Media, Information Exchange Media, Presentation Spaces & Values, and Presentation Dimensions; Sound: Frequency, Amplitude, Sound Perception and Psychoacoustics; Audio Representation on Computers; Three-Dimensional Sound Projection; Music and MIDIStandards; Speech Signals; Speech Output; Speech Input; Speech Transmission.

UNIT-II

Graphics and Images, Video Technology, Computer-Based Animation **9 Hrs**

Capturing Graphics and Images Computer Assisted Graphics and Image Processing, Reconstructing Images, Graphics, and Image Output Options. Basics, Television Systems, Digitalization of Video Signals, Digital Television; Basic Concepts, Specification of Animations, Methods of Controlling Animation, Display of Animation, Transmission of Animation, Virtual Reality Modelling Language.

UNIT III

Multimedia Data Compression **9 Hrs**

Types of compression Binary image compression colour, gray scale and still video image compression video image compression audio compression fractal compression. Data and file formats: RTF TIFF RIFF, MIDI, JPEG, AVI video file formats, MPEG standards.

UNIT IV **9 Hrs**

Multimedia Applications

Media Preparation and composition, Media integration and communication, Media Entertainment, Telemedicine, E-Learning, Digital Video editing and production system, Video Conferencing.

Textbooks:

1. **Ralf steinmetz, Klara Narstedt: Multimedia Fundamentals Volume 1: Media Coding and Content Processing, 2nd Edition, Pearson Education, 2003.**
2. **Brabhat K Andleigh, Kiran Thakrar: Multimedia System Design PHI 2003.**

Reference Books:

1. K R Roa, Zoran S, Bojkovik and dragorad A: Multimedia communication systems: Techniques, standards, and networks. Pearson Edition 2002.
2. Nalin K sharid: Multimedia Information networking PHI, 2002

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CPS312	CO1	-	-	2	2	2	3	3	-	-	2
	CO2	-	-	2	2	2	3	3	-	-	2
	CO3	-	-	2	2	2	2	2	-	-	2
	CO4	-	-	2	2	2	2	2	-	-	2

Course Code	Classical Optimization	Type	L	T	P	C	Hrs/Week
B21ASO301		OE	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. Make the students to know about the optimization techniques.
2. Make the students to know about unconstrained minimization techniques.
3. Make the students to know about unconstrained minimization techniques to solve non-linear programming problems.
4. Make the students to know about constrained minimization techniques.

Course Outcomes:

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

1. Able to implement optimization techniques.
2. Able to implement unconstrained minimization techniques.
3. Able to solve non-linear programming problems by unconstrained minimization techniques.
4. Able to solve non-linear programming problems by constrained minimization techniques.

Course Contents:

UNIT-I:

Introduction to optimization, engineering applications of optimization, Formulation of structural optimization problems as programming problems. Optimization Techniques: Classical optimization techniques, single variable optimization, multivariable optimization with no constraints.

UNIT-II:

Unconstrained minimization techniques and algorithms constrained optimization solutions by penalty function techniques, Lagrange multipliers techniques and feasibility techniques.

UNIT-III:

Non-linear programming, one dimensional minimization methods, elimination methods, Fibonacci method, golden section method, interpolation methods, quadratic and cubic methods, Unconstrained optimization methods, direct search methods, random search methods, descent methods.

UNIT-IV:

Constrained optimization techniques such as direct methods, the complex methods, cutting plane method, exterior penalty function methods for structural engineering problems. Formulation and solution of structural optimization problems by different techniques.

Textbooks:

(i) “Operations Research” by J.K. Sharma
(ii) “Operations Research” by S.D. Sharma

Reference Books:

1. Spunt, “Optimum Structural Design”- Prentice Hall
2. S.S. Rao, “Optimization – Theory and Practice”- Wiley Eastern Ltd.
3. Uri Krisch, “Optimum Structural Design”- McGraw Hill

4. Richard Bronson, “Operation Research”- Schaum‟s Outline Series
5. Bhavikatti S.S.- “Structural optimization using sequential linear programming”- Vikas publishing house.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21ASO301	CO1	3	3	2	2					2	3
	CO2	3	2	2	3					3	2
	CO3	3	2	3	2					3	2
	CO4	3	3	3	2					3	3

Course Code	Physics in Everyday Life	Type	L	T	P	C	Hrs/Week
B21ASO303		OE	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. To have a clear understanding of the working and principles of home appliances
2. To understand phenomena of light and its application
3. To know the formation of clouds and cyclic process.
4. To implement and understand properties of smart materials for their application in various places.

Course Outcomes:

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

1. To have a clear understanding of the working and principles of home appliances.
2. To understand phenomena of light and its application.
3. To know the formation of clouds and cyclic process.
4. To implement and understand properties of smart materials for their application in various places.

Course Contents:

UNIT-I: Gadgets in Daily Life

Principle of levers, Frictional force, Electric bulb, fan, and motor, Washing Machine, Kitchen Electronics; Microwave, Dishwasher, Induction Stoves, Basics of Smartphones, Smart Refrigerators, Smart alarms, Smart floor, Smart locks, batteries, working principle of Microphone and Loudspeaker, Radio and Radio waves, AM and FM, Basics of Digital Cameras.

UNIT-II: Applications of Electromagnetic Waves

Introduction to Electromagnetic waves and applications, Scattering of light in atmosphere, LASER and application, Hologram and 3D pictures, Optical fibers and communication system, RADAR & navigation and its applications, Display systems: CRT, LCD, LED and Photodiode, Mobile communication.

UNIT-III: Atmosphere

Clouds: Introduction, Atmospheric thermodynamics, Vapor pressure, Formation of Cloud droplets, Lightning, electrical properties of the fair, weather atmosphere, electrical properties of a thunderstorm, Benjamin Franklin's famous kite experiment, cloud-to-ground lightning, Intra-cloud lightning, other forms of lightning, thunder, lightning rods, lightning safety.

UNIT-IV: Advanced Materials

Superconductors, Semiconducting materials, physical principles of optical materials; Polaroids and goggles, dielectrics, piezoelectric, ferroelectric, pyroelectric, magnetic materials and their applications, Motion Sensors, Thermal Sensors and Image Sensors, and Water Level Sensors.

Recommended Books:

1. Louis A. Bloomfield, How Things Work: The Physics of Everyday Life, 6th Edition, Wiley 2016.
2. DK, How to Be Good at Science, Technology, and Engineering, DK Publishing, 2018.
3. DK, How Things Work Encyclopedia, DK Publishing, 2009.
4. DK, How Technology Works: The Facts Visually Explained, DK Publishing, 2019.
5. Thomas L Floyd "Electronic Devices" 10th Edition Pearson Education Asia 2018.
6. Jordan Frith, “Smartphones as Locative Media ", Wiley 2014.
7. M. I. Skolnik, Introduction to Radar Systems, Tata McGraw Hill 2006.
8. R. R. Rogers, A Short Course in Cloud Physics, 3rd Edition, 1889, Reprint 1996.
9. Dennis C Brewer, " Home Automation", Que Publishing 2013.
10. T. Pratt, C. Bostian and J. Allnutt, Satellite Communications, John Wiley and Sons, Second Edition., 2003.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21ASO303	CO1	3	3	3	3					3	3
	CO2	3	3	3	3					3	2
	CO3	3	2	2	2					3	3
	CO4	3	3	2	2					3	2

Course Code	Water Technology	Type	L	T	P	C	Hrs/Week
B21ASO304		OE	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. Determine the basic concepts of water pollution, various water analysis methods like COD, BOD, TOC, hardness and properties of water.
2. Analyze the estimation of dissolved oxygen, alkalinity, acidity and chlorides in water, Water treatment for domestic purpose.
3. Enhance knowledge one Ion-exchange processes, and lime soda process.

4. Conclude the biological relevance of pH and pKa of functional groups in biopolymers, proteins and nucleic acids.

Course Outcomes:

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

1. Differentiate between the Organic pollutants and Inorganic pollutants
2. Acquired the knowledge about acid-base reactions and alkalinity/acidity to solve problems associated with water/wastewater treatment and natural water quality.
3. Explain the hardness of water and their internal and external treatment.
4. Analyze properties of water and buffers, pH value of various bio-entities

Course Objectives:

UNIT-I

Introduction, Sources, Water pollutants classification: Organic pollutants –Pesticides, insecticides, detergents. Inorganic pollutants, Sediments, Radioactive materials, and Thermal pollutants. Drinking water supplies, Trace elements in water. COD, BOD, TOC-definitions. Monitoring techniques and methods: Determination of pH, conductance, dissolved oxygen by Winkler"s method, nitrate/nitrite by diazo coupling, chloride by Mohrs and Volhard"s method, and fluoride by Alizarin Visual method, Water contamination with cyanide, sulfide, sulphate, phosphate, and total hardness. Analysis of Arsenic by Atomic absorption spectroscopy (AAS), cadmium and mercury by dithizone method, chromium by diphenyl carbazide method, lead by polarographic method. Water pollution control and management.

UNIT-II

Determination of Hardness of water and its Units, Disadvantages of hard water, Estimation of hardness by EDTA method, Numerical problems on hardness, Estimation of dissolved oxygen, Alkalinity, acidity and chlorides in water, Water treatment for domestic purpose (Chlorination, Bleaching powder, ionization)

Industrial Use of water: For steam generation, troubles of Boilers: Scale & Sludge, Priming and Foaming, Caustic Embrittlement and Boiler Corrosion.

UNIT-III

Treatment of Boiler Feed water: Internal Treatment: Colloidal, Phosphate, Carbonate, Calgon and sodium aluminate treatment.

External Treatment: Ion-Exchange and Permutit processes, Lime soda process.

Demineralization of brackish water: Reverse Osmosis and Electro dialysis Determination of turbidity of wastewater, Total solids, volatile solids and fixed solids of wastewater, nitrogen, Phosporous from wastewater.

UNIT-IV

Properties of water: Ionic product of water and its measurements. Importance of water in biological system with special reference to the maintenance of the native structure of biological molecules. Types of bonding in biological molecules. Biological relevance of pH and pKa of functional groups in biopolymers, proteins, and nucleic acids. Buffers, pH value of various bio-entities, buffer action, buffer capacity and their importance in biological systems. Isoelectric points for amino acids. Titration of proteins and preparation of buffer.

Karl-Fischer titrations: Stoichiometry of the reaction, preparation of the reagent, titration method, standardization of the reagent using water-in-methanol, determination of water in samples, interference and their elimination, application to quantitative analysis of some organic compounds-alcohols, carboxylic acids, acid anhydrides and carbonyl compounds.

References:

1. Jain and Jain, D. Rai, A Textbook of Engineering Chemistry, Himalaya Publications, New Delhi, 2012.
2. K.B. Chandra Sekhar, U.N. Das and S. Mishra, Engineering Chemistry, SCITECH Publications India Pvt Limited, 2012.
3. A. Srivastava and N.N. Janhavi, Concepts of Engineering Chemistry, Himalaya Publications, 2014.
4. C.P. Murthy, C.V. Agarwal and A. Naidu, Textbook of Engineering Chemistry, Dhanapathirai Publications, 2012.
5. C.V. Agarwal and C. P. Andranaidu, Chemistry of Engineering Materials, Dhanapathirai Publications, 2013.
6. Shashichawla, Textbook of Engineering Chemistry, Dhanapathirai Publications. 2012.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21ASO304	**CO1**	2	1	1	1	1			2	1	1
	CO2	2	1	1	1	1			2	1	1
	CO3	2	1	1	1	1			2	1	1
	CO4	2	1	1	1	1			2	1	1

Course Code	Skill Development Program	Type	L	T	P	C	Hrs/Week
B21SHM301		MC	0	0	0	0	2

Course Objectives:

This course aims to provide for the students to:

1. Acquire skill in solving problems on differential calculus using *Python*.
2. Acquire proficiency in using *Python* to solve the concept of sequence and series of real numbers.
3. Obtain skill in creating programs on vector calculus using *Python*.
4. Obtain skill in creating programs on solving partial differential equations.

Course Outcomes:

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

1. Demonstrate the use of *Python* to understand and interpret the core concepts in sequences and series.
2. Demonstrate the use of *Python* to apply ratio test, root test and Raabe‟s test to test the convergence of a series.
3. Exhibit proficiency in using *Python* to vector derivatives
4. Obtain the proficiency in using python to solve partial differential equations.

Course Contents:

List of programs:

1. Illustration of convergent, divergent and oscillatory sequence.
2. Illustration of convergent, divergent and oscillatory series.
3. Using Cauchy's criterion to determine the convergence of a sequence.

4. To find the sum of the series.
5. To demonstrate the physical interpretation of gradient, divergence curl and laplacian.
6. Using cyclic notations to derive some more vector identities
7. Solutions to the problems on solenoidal and irrotational vecotrs.
8. Solutions to the problems on different types of Partial differential equations.
9. Solving second order linear partial differential equations in two variables with constant coefficient.
10. Solving some more second order linear partial differential equations in two variables with constant coefficient.

Text Books:

1. Farukh Khalilov and Tayyip oral, Math coding Python, 5th Edition, USA-2020.
2. Joakim Sundnes, Introduction to Scientific programming with Python, 2nd Edition, Springer 2010.
3. Allen Downey and Jeffrey Elkner, Learning with Python, 5th Edition, Springer, 2015.
4. Eric Matthes, A Hands-On, Project-Based Introduction to Programming- Python Crash Course, 2nd Edition:
5. Al Sweigart, Automate The Boring Stuff With Python: Practical Programming For Total Beginners, 2nd Edition.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0302	**CO1**	3	2	2	1	1	1		1	3	2
	CO2	3	2	2	1	1			1	3	3
	CO3	3	2	2	1	1			1	3	2
	CO4	3	2	2	1			1	1	2	2

Course Code	Physics Practicals-III	Type	L	T	P	C	Hrs/Week
B21PH0302		HC	0	0	1.5	1.5	3

Course Objectives:

This course aims to provide for the students:

1. To visualise simple harmonic wave motions and verify the theories that govern them.
2. To visualise interference, diffraction and polarization of light.
3. To use different optical phenomenon in different applications.
4. To visualize different spectal lines.

Course Outcomes:

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

1. Explain the phenomenon related to simple harmonic motion waves.
2. Determine the thickness of thin objects, radius of curvature of a plano-convex lens by interference and diffraction.
3. Analyse observed optical phenomenon in nature.
4. Estimate the refractive index of glass.

Course Contents:

Any **Eight** of the Following Experiments:

1. Determination of radius of curvature of a Plano - convex lens (Newton's rings).
2. Determination of diameter of a thin wire (Air wedge).
3. Determination of grating constant and wavelength (minimum deviation method).
4. Determination of diameter of a wire (Diffraction at a straight wire).
5. Determination of Cauchy's constants using spectrometer.
6. Determination of unknown concentration of sugar solution by graphical method using a polarimeter.
7. Determination of refractive indices of quartz crystal using spectrometer and sodium light.
8. Determination of attenuation coefficient in an optical fiber.
9. Determination of velocity of sound in a liquid by ultrasonic interferometer.
10. Determination of resolving power of plane transmission grating using spectrometer.

Textbooks:

1. Thiruvadigal, J. D., Ponnusamy, S. Sudha. D. and Krishnamohan M., "Physics for Technologists", Vibrant Publication, Chennai, 2013
2. R. K. Shukla and Anchal Srivastava, "Practical Physics", 1st Edition, New Age International (P) Ltd, New Delhi, 2006.

Reference Books:

1. G. L. Souires, "Practical Physics:", 4th Edition, Cambridge University, UK, 2001.
2. D. Chattopadhyay, P. C. Rakshit and B. Saha, "An Advanced Course in Practical Physics", 2nd ed., Books & Allied Ltd., Calcutta, 1990.
3. D. Chattopadhyay, P.C. Rakshit B. Saha, An Advanced Course in Practical Physics, New Central Book Agency (P) Limited, Kolkata, Sixth Revised Edition, 2002.
4. CL Arora, BSc Practical Physics, S. Chand & Co, New Delhi, Revised Edition, 2007.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0302	CO1	3	3	3	3					3	1
	CO2	3	3	2	1					2	2
	CO3	3	3	2	2					2	1
	CO4	3	3	3	1					3	3

Course Code	RDBMS LAB	Type	L	T	P	C	Hrs/Week
B21CP0302		HC	0	0	1.5	1.5	3

Course Objectives:

The major objective of this lab is to provide a strong formal foundation in database Concepts, technology and practice to the participants to groom them into well-informed database application developers.

1. To present SQL and procedural interfaces to SQL comprehensively.
2. To introduce systematic database design approaches covering conceptual.
3. Design, logical design, and an overview of physical design.

4. To give a good formal foundation on the relational model of data.

Course Outcomes:

1. Understand, appreciate, and effectively explain the underlying concepts of database technologies.
2. Design and implement a database schema for a given problem-domain.
3. Normalize a database.
4. Populate and query a database using SQL DML/DDL commands.
5. Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS.
6. Programming PL/SQL including stored procedures, stored functions, cursors, Packages.

Course Contents:

PART – A

1. Draw E-R diagram and convert entities and relationships to relation table for a given scenario.
   a. Two assignments shall be carried out i.e. consider two different scenarios (eg. Bank, college)

2.Date and Time Functions

3. The STUDENT detail databases has a table with the following attributes. The primary keys are underlined.

STUDENT (<u>regno: int</u>, name: string, dob: date, marks: int)

i) Create the above table.
ii) Remove the existing attributes from the table.
iii) Change the data type of regno from integer to string.
iv) Add a new attribute phoneno to the existing table.
v) Enter five tuples into the table.
vi) Display all the tuples in student table.

4. A LIBRARY database has a table with the following attributes.

LIBRARY (bookid:int, title: string, author: string, publication: string, yearpub:int, price: real)

i) Create the above table.
ii) Enter the five tuples into the table
iii) Display all the tuples in student table.
iv) Display the different publishers from the list.
v) Arrange the tuples in the alphabetical order of the book titles.
vi) List the details of all the books whose price ranges between Rs. 100 and Rs. 300

5. The SALARY database of an organization has a table with the following attributes.

EMPSALARY (empcode:int, empname:string, dob:date, department:string, salary:real)

i) Create the above table.
ii) Enter the five tuples into the table
iii) Display all the number of employees working in each department.

iv) Find the sum of the salaries of all employees.
v) Find the sum and average of the salaries of employees of a particular department.
vi) Find the least and highest salaries that an employee draws.

6. Consider the following DATABASE OF STUDENTS ENROLLMENT in courses and books adopted for each course. (ER-Diagram).
STUDENT (regno: string, name: string, branch: string, bdate: date)
COURSE (course-no: int, cname: string, dept: string)
ENROLL (reg-no: string, course-no: int, sem: int, marks: int)
BOOK-ADOPTION (course-no: int, sem: int, book-isbn: int)
TEXT (book-isbn: int, book-title: string, publisher: string, author: string)

i) Create the above tables by properly specifying the primary keys and the foreign keys
ii) Enter at least five tuples for each relation.
iii) Demonstrate how you add a new text book to the database and make this book be adopted by some department.
iv) Produce a list of text books (include Course-no, book-isbn, book-title) in the alphabetical order for courses offered by the „Compute Science" department that use more than two books.
v) List any department that has all its adopted books published by a specific publisher.

7. The following tables are maintained by a Book Dealer

AUTHOR (author-id: int, name: string, city: string, country: string)
PUBLISHER (publisher-id: int name: string, city: string, country: string)
CATLOG (book-id: int, title:string,author-id:int, publisher-id:int, category:int, year:int, price: int)
CATEGORY (category-id: int, description: string)
ORDER-DETAILS (order-no: int, book-id: int, quantity: int)
i) Create above tables by properly specifying the primary keys and the foreign keys.
ii) Enter atleast five tuples for each relation.
iii) Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2010.
iv) Find the author of the book which has maximum sales.
v) Demonstrate how to increase price of books published by specific publisher by 10%

8. Consider the following DATABASE FOR ORDER PROCEESING.

CUSTOMER (cust-no: int, cname: string, city: string)
ORDER (orderno: int, odate: date, ord-amt: real)
ORDER_ITEM (orderno: int, itemno:int, qty: int)
ITEM (itemno: int, UNITprice: real)
SHIPMENT (orderno: int, warehouseno: int, ship-date: date)
WAREHOUSE (warehouseno: int, city: string)

i) Create the above tables by properly specifying the primary keys and the foreign keys
ii) Enter at least five tuples for each relation.
iii) List the order number and ship date for all orders shipped from warehouse.
iv) Produce a listing: customer name, no of orders, average order amount
v) List the orders that were not shipped within 30 days of ordering.

PART – B

During practical examination the External and Internal examiners may prepare exam question paper related to theory syllabus apart from Part-A. (A minimum of 6 Programs has to be prepared).

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0302	**CO1**	3	3	3	3	0	0	0	3	3	1
	CO2	3	3	2	1	0	0	0	1	2	2
	CO3	3	3	2	2	0	0	1	3	2	1
	CO4	3	3	3	1	0	0	0	3	3	3

FOURTH – SEMESTER

Course Code	Language-II: Kannada - IV	Type	L	T	P	C	Hrs/Week
B21AHK401		FC	1	1	0	2	3

Course Objectives:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ನಾಲ್ಕನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ **ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯ ಪ್ರಕಾರಗಳಾದ**

ನವ್ಯ, ಸ್ತ್ರೀವಾದಿ ಹಾಗು ನವ್ಯೋತ್ತರ ಕಾವ್ಯ, ವಿವಿಧ ಲೇಖನಗಳು ಹಾಗು ಕಾದಂಬರಿ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

1. ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
2. ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಮೂಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ

   ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.
3. ಅವರಲ್ಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಭಾಷೆ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ
4. ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

Course Outcomes:

ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯ ಪ್ರಕಾರಗಳಾದ ನವ್ಯ-ನವ್ಯೋತ್ತರ ಕಾವ್ಯ, ವಿವಿಧ ಲೇಖನಗಳು ಹಾಗು ಕಾದಂಬರಿ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟ ಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

1. ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
2. ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
3. ಸಾಮಾಜಿಕ ಅರಿವು ಮೂಡಿಸುತ್ತದೆ.
4. ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.

Course Contents:

ಗಙಞ ಖ **ನವ್ಯ-ಸ್ತ್ರೀವಾದಿ ಕವಿತೆಗಳು** 7 ಏಡಿ

1. ಬುದ್ಧಿವಂತರಿಗೆ ಕನಸು ಬಿದ್ದರೆ ಎ.ಕೆ.ರಾಮನುಜನ್
2. ಕುರಿಗಳು ಸಾರ್ ಕುರಿಗಳು ನಿಸಾರ್ ಅಹಮದ್
3. ಅಕ್ಕ ಹೇಳಿದು ಸ. ಉಷಾ

ಗಙಞ ಖಖ **ದಲಿತ-ಬಂಡಾಯ** 7 ಏಡಿ

1. ನನ್ನ ಕವನಗಳಲ್ಲಿ ಹುಡುಕದಿರು ನನ್ನ ಚಂಪಾ
2. ದಲಿತರು ಬರುವರು ದಾರಿಬಿಡಿ ಸಿದ್ಧಲಿಂಗಯ
3. ಕಟ್ಟಡದ ಕೆಲಸಗಾರರು ಎಚ್ ಎಸ್ ಶಿವಪ್ರಕಾ ಶ

ಗಙಞ ಖಖಖ **ಲೇಖನಗಳು** 6 ಏಡಿ

1. ಹಸಿರು ಹೊಸಕುವ ಗಣಿಗಳು ಯಲ್ಲಪ್ಪ ರೆಡ್ಡಿ
2. ಜಾಗತೀಕರಣದ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ಗಾಂಧೀಜಿಯ ಪ್ರಸ್ತುತತೆ ಸಿ. ನಾಗಣ್ಣ
3. ಚಾರ್ವಾಕರು: ಒಂದು ಟಿಪ್ಪಣಿ ಪಿ ಎನ್ ರಂಗನ್

ಗಙಞ ಖಗಿ **ಕಾದಂಬರಿ** 6 ಏಡಿ

1. ಸಂಸ್ಕಾರ (ಆಯ್ದಭಾಗ) ಯು.ಆರ್. ಅನಂತಮೂರ್ತಿ

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು :

1. ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸೀಮಾತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
3. ಹಂಪ ನಾಗರಾಜಯ್ಯ, ಸಾಂಗತ್ಯ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
4. ರಂಜಾನ್ ದರ್ಗಾ, ಶರಣರ ಸಮಗ್ರ ಕ್ರಾಂತಿ, ಪ್ರಕಾಶಕರು. ಲೋಹಿಯಾ ಪ್ರಕಾಶನ, ಬಳ್ಳಾರಿ. 2015
5. ವಸಿಷ್ಠ., ರತ್ನಾಕರವರ್ಣಿಯ ಭರತೇಶ ವೈಭವ, ಪ್ರಕಾಶಕರು ಚೇತನ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 1999
6. ಡಾ. ಅರವಿಂದ ಮಾಲಗತ್ತಿ, ಸಾಹಿತ್ಯ ಸಂಸ್ಕೃತಿ ಮತ್ತು ದಲಿತ ಪ್ರಜ್ಞೆ, ಪ್ರಕಾಶಕರು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2014
7. ಡಾ. ಈ.ಎಸ್. ಆಮೂರ, ಕನ್ನಡ ಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
8. ಕೀರ್ತನಾಥ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಟ್ರಸ್ಟ್, ಧಾರವಾಡ. 2009
9. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು –2014
10. ಸಂ. ಡಾ! ಸಿ. ಆರ್. ಚಂದ್ರಶೇಖರ್, ಮುಂದಾಳುತನದ ಲಕ್ಷಣಗಳನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವುದು ಹೇಗೆ?, ಪ್ರಕಾಶಕರು ನವಕರ್ನಾಟಕ ಪಬ್ಲಿಕೇಷನ್ಸ್ ಪ್ರೈವೆಟ್ ಲಿಮಿಟೆಡ್. 2010
11. ಆಧುನಿಕ ಕನ್ನಡ ಕಾವ್ಯ ಭಾಗ-2, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2004
12. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

Mapping of Course Outcomes with programme Outcomes

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

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

Course Objectives:

This course aims to provide for the students:

1. संदर्भानुसार उचित भाषा का प्रयोग करने की दक्षता को छात्रों में उत्पन्न करना।

2. सभचहत्य क े मभध्यम स े समभज एव ं मभनवीय म ू ल्् य ो ं क ो समझभकर, उन म ू ल्् य ो ं क ो रक्षभ ह े त ु प्र े रर त करनभ |

3. छभत्र ो ं म े ं प ु स्तक पठन एव ं ल े खन क ी अक ृ चतम प्रव ृ चि स्थभचपत करनभ |

4. अध्य े तभओ ं म े ं सभचहत्य क े मभध्यम स े प्रभर्व ी एव ं क ु शल स ं ि भर कभ चवकभस करनभ |

Course Outcomes:

अध्ययन की समभप्ति पर अध्येतभ –

1. सभममभचजक म ू ल्् एव ं न ै चतक जवभबद े ह ी क ो स्वीकभर कर सकतभ ह ै |
2. सभचहत्य क ी प्रभस ं चगकतभ क ो जीवन म े ं समझन े क ी दक्षतभ रखतभ ह ै |
3. समभज म े ं अ ं तचनचहत पद्दचतयभँ एव ं चव ि भरधभरभओ ं कभ व्यभख्यभन करन े म े ं सक्षम बन सकतभ ह ै |
4. सभचहत्य क े मभध्यम स े प्रभर्व ी एव ं क ु शल स ं ि भर कभ चवकभस कर सकतभ ह ै |

Course Contents:

इकाई – 1: ख ं ि कभव्य – नहुष – म ै चथलीशरण ग ु प्त **7 hrs**

कचव पररिय

ाD

पररि य

शि ी सगा

नहुष सगा

इकाई – 2: ख ं ि कभव्य – नहुष – म ै चथलीशरण ग ु प्त **7 hrs**

उवशी सगा

स्वगभोग सगा

इका ई – 3: ख ं ि कभव्य – नहुष – म ै चथलीशरण ग ु प्त **6 hrs**

सन्द े श

सगा

मत्रण ा

सगा पतन

सगा

इकाई – 4: लसलनमा रिव्यू **6 hrs**

स ू पर 30, चमशन मगल, थप्पड़, आचटा ल 15

स ू चन ा: प्रत्य े इ ाई 25 अ ं े चलए चनध ाररत ह ै |

Textbooks: पाठ्य पुस्तक:

1. ख ं ड-क ाव्य – नह ु ष – म ै लथि ीशि ण ग ु प्त

References: सन्दर् ग्रन्थ

1. रस – छद – अल ं र - ृ ष्णद े व शम ाा& स ु र े श अग्रवाल
2. चहन्दी सभचहत्य कभ इचतहभस - ि ॉ. नभगेन्द्र
3. आधुचनक चहन्दी सभचहत्य कभ इचतहभस - ि ॉ. बच्चन चसंह

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21AHH401	**CO1**					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			

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

Course Objectives:

This course aims to provide for the students:

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

Course Outcomes:

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

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

Course Contents:

UNIT – I: Myths & Mythology **6 hrs**

John W. May – Narcissus; W.B. Yeats – The Second Coming; Devdutt Pattanaik - *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 – TheStory 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 – Adventuresof 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:

1. Finneran, Richard J. *The Collected Works of W.B. Yeats* (Volume I: The Poems: Revised Second Edition). Simon & Schuster, 1996.
2. Pattanaik, Devdutt. *Shikhandi: Ánd Other „Queer" Tales They Don"t Tell You.* Penguin Books, 2014.

3. Karve, Irawati. *Yuganta: The End of an Epoch*. Orient Blackswan, 2007.
4. Ezekiel, Nissim. *Collected Poems* (With A New Introduction By John Thieme). OUP, 2005.
5. Hughes, Langston. *The Collected Poems of Langston Hughes*. Vintage, 1995.
6. Chopin, Kate. *The Awakening and Selected Stories of Kate Chopin*. Simon & Schuster, 2004.
7. Ibsen, Henrik. *A Doll‟s House*. Maple Press, 2011.
8. Poe, Edgar Allan. *The Complete Poetry of Edgar Allan Poe*. Penguin USA, 2008.
9. Stoker, Bram. *Dracula*. Fingerprint Publishing, 2013.
10. Ray, Satyajit. *The Complete Adventures of Feluda* (Vol. 2). Penguin Books Ltd., 2015.
11. Lama, Dalai. *Freedom In Exile: The Autobiography of the Dalai Lama of Tibet*. Little, Brown Book Group, 1998.
12. Murthy, Sudha. *Wise and Otherwise: A Salute to Life*. Penguin India, 2006.

Mapping of Course Outcomes with programme Outcomes

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

Course Code	Mathematics –IV	Type	L	T	P	C	Hrs/Week
B21MT0401		HC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. Get familiar with the theories on rings, integral domains and fields.
2. Introduce the basic concepts of abstract algebra.
3. To understand the concepts of solid geometry and its applications in various fields.
4. Demonstrate an understanding of and be able to use Green‟s Theorem for the plane, Stokes Theorem, and Gauss‟ divergence Theorem to simplify and solve appropriate integrals.

Course Outcomes:

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

1. Explain the fundamental concepts of abstract algebra such as rings, fields and their role in modern mathematics and applied contexts.
2. Apply the concepts of solid geometry and to solve problems of various fields.
3. Compute double integrals and be familiar with change of order of integration.
4. Apply Green‟s Theorem, Divergence Theorem and Stoke‟s Theorem.

Course Contents:

Unit-I: - Ring theory **14 hrs**

Rings – Subrings, Examples – Integral Domains – Division rings – The ring of quaternions- Fields--Subfields with examples- Homomorphism of Rings – Definition and elementary properties, Maximal and Prime ideals.

Unit-II: Analytical geometry in 3-D **14 hrs**

(Recapitulation of three-dimensional geometry - Different forms of equations of straight line and plane). Angle between two planes - Line of intersection of two planes - Plane coaxial with given planes - Planes bisecting the angle between two planes - Angle between a line and a plane - Coplanarity of two lines - shortest distance between two lines. Equation of the sphere in general and standard forms - equation of a sphere with given ends of a diameter. Tangent plane to a sphere, orthogonallity of spheres. Standard equations of right circular cone and right circular cylinder.

Unit-III: Multiple integrals **14 hrs**

Definition of a line integral and basic properties – Examples on evaluation of line integrals – Double integrals- Change of order of integration –change of variables (polar coordinates, area enclosed by plane curves, evaluation of triple integrals and volume of solids.

Unit-IV: Vector Integration **14 hrs**

Integration of vectors- line integral (circulation, work done)-Surface integral (flux), Green‟s theorem (with proof) - Direct consequences of the theorem. The Divergence theorem (without proof) and problems (verification and evaluation). The Stokes‟ theorem (without proof) and problems (verification and evaluation) - Direct consequences of the theorem.

Text Books:

1. Shanthi Narayan, Analytical Solid Geometry. New Delhi: S. Chand and Co. Pvt. Ltd., 2004.
2. D E Bournesand and P C Kendall, Vector Analysis, ELBS, 1996
3. M. D. Raisinghania, Vector Calculus, S Chand Co. Pvt. Ltd., 2013

Reference Books:

1. I N Herstien – Topics in Algebra
2. John B Fraleigh, A First course in Abstract Algebra, 3rd ed.: Narosa Publishing House., 1990.
3. R. Balakrishan and N. Ramabadran, A Textbook of Modern Algebra, 1st ed. New Delhi, India: Vikas publishing house pvt. Ltd., 1991.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/ COs	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0401	CO1	3	3	2	3	2				3	3
	CO2	3	3	2	3	2				3	3
	CO3	3	3	2	3	2				3	2
	CO4	3	2	1	2	2				3	3

Course Code	Electricity and Electromagnetism	Type	L	T	P	C	Hrs/Week
B21PH0401		HC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. Describe how static electricity is produced and list examples where its effects are observed.
2. Describe how magnetism is produced and list examples where its effects are observed.
3. Identify the connection between electricity and magnetism.
4. Develop understanding the concepts in electricity and magnetism.

Course Outcomes:

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

1. Calculate the force on a charged particle.
2. Explain the method of measuring voltage and frequency using CRO.
3. Explain the response of LR, CR and LCR circuits frequencies.
4. Explain Anderson"s bridge, thermocouple, and self-inductance of solenoid.

Course Contents:

UNIT-I

Thermoelectricity: The Thermocouple, Seebeck, Peltier, and Thomson effects, Thermodynamic theory of thermoelectric effect, Neutral temperature, Temperature of inversion, The law of intermediate metals, and the law of intermediate temperatures. Numerical problems.

Network Theorems: Mesh analysis circuits using KVL and KCL, Statement and proof of Thevenin's theorem, Norton's theorem, and Superposition theorem, Applications to DC circuits. Numerical problems.

UNIT-II

Electromagnetism: Scalar and Vector fields, The gradient of a scalar field, The divergence and curl of a vector field, The physical significance of gradient, divergence, and curl, Statement and theorems of Gauss and Stokes, Numerical problems.

Electromagnetic theory: Equation of continuity, Maxwell's modification of Ampere circuital law; Displacement current, Setting up of Maxwell's field equations. Maxwell's field equations in free space, Poynting vector (definition). Wave equation for the field vectors in free space and in isotropic dielectric. Energy density of electromagnetic wave and Poynting Theorem (Proof). Plane monochromatic electromagnetic waves - Transverse nature. Helmholtz equation. Characteristic impedance of free space. Hertz's experiment. Numerical problems.

UNIT-III

CRO: Construction and working. Measurement of voltage, frequency, and phase using a CRO, Measurement of various electrical parameters using Multimeter.

Alternating current: Average, Peak, and RMS values. Response of LR, and CR circuits to sinusoidal voltages (discussion using the `j' symbols). Series Resonance and parallel resonance-half-power frequencies, band - width and Q- factor. Power in electrical circuits- power factor. Maximum power transfer theorem for ac circuits (statement and proof). Numerical problems.

UNIT-IV

Applications of ac circuits:

i) **AC bridges** - Anderson's bridge, Maxwell's bridge, de Sauty bridge, Numerical problems.

ii) **Frequency filters** - High-pass and low-pass filters with LC, LR, and CR combinations. Expression for cut-off frequency, Band pass filters. Numerical problems including designing the filters.

References

1. Tewari K K, Electricity and Magnetism, Revised Edn., S Chand and Company, 2007.
2. Vasudeva D N, Fundamentals of Magnetism and Electricity, 9th edn, S.Chand, and Company, 2013.
3. Laud B B, Electrodynamics, Revised 2nd Edn., New Age International, 2005.
4. David J Griffiths, Introduction to Electrodynamics, 4th Edn., Prentice Hall of India, 2017.
5. Hayt W H, and Buck J A, Engineering Electromagnetism, 8th Edn., Tata McGraw Hill, 2017.
6. Mehta V K, Principles of Electronics, S Chand, and Co., 2005.
7. Brij Lal, and Subrahmanyam N, A Textbook of Electricity and Magnetism, 19th Edn., Ratan Prakashan Mandir, 2016.
8. Bhattacharya A B, and Bhattacharya R, Undergraduate Physics Vol. 2, New Central Book Agency, 2008.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0401	CO1	3	2	1	1					3	2
	CO2	3	2	3	2					3	2
	CO3	3	3	3	3					3	3
	CO4	3	2	2	2					3	2

Course Code	Unix and Shell Programming	Type	L	T	P	C	Hrs/Week
B21CP0401		HC	3	0	0	3	4

Course Objectives:

1. Learn basic commands to interact with UNIX System and VI editor.
2. Understand the history, origin, features and architecture of UNIX Operating System.
3. The usage of various commands in UNIX environment.
4. Develop the ability to evaluate regular expressions and use them for pattern matching.
5. Apply essential facets of SHELL programming to solve the SHELL script problems.

Course Outcomes:

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

1. Describe history, origin, feature, and architecture of UNIX operating system.
2. Interact with UNIX system easily.
3. Construct and edit files, search for any patterns using regular expressions.
4. Solve complex jobs using tools and utilities available in UNIX. • Design and develop various tasks by using Shell scripting.

Course Contents:

UNIT -I

Introduction **12 Hrs**

Introduction, History, Architecture, General Purpose Utilities: cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, bc. Introduction to Shell Scripting, Shell Scripts, read, Command Line Arguments, Exit Status of a Command, The Logical Operators, exit, if, and case conditions, expr, sleep and wait, while, until, for, redirection, set and shift, trap.

UNIT –II 12 Hrs

File System:

The File, Home Directory, Parent Child Relationship, Checking Current Working Directory, Making Directories, Removing Directories, Listing Directory Contents. Absolute path names, Relative path names. The UNIX file system. Basic File Attributes: Is options, File Permissions, chmod, Security and File Permission, users and groups, security level, changing permission, changing ownership and group, hard link, symbolic link, umask, find.

UNIT –III 12 Hrs

Simple Filters and Awk

Pr, head, tail, cut, paste, sort, uniq, tr commands, Filters using Regular Expression: grep, egrep, fgrep, sed instruction, Line Addressing, Inserting and Changing Text, Context addressing, writing selected lines to a file, the– f option, Substitution, Awk-Advanced Filters: Simple awk Filtering, splitting a Line into Fields, printf, the Logical and Relational Operators, The –f option, BEGIN and END positional Parameters,

UNIT –IV 12 Hrs

Process and System Administration:

Process basics: ps: process status, system processes (-e or –a), mechanism of process creation, process states and zombies, running jobs in background, job execution, job control. nice, at and batch, cron, time commands, Essential System Administration root, administrator‟s privileges, startup & shutdown, managing disk space, cpio, tar.

Textbook:

1. Sumitabha Das: “UNIX – Concepts and Applications”, (Chapters 1,2,4,6-9,11-14,17,19), Tata McGraw Hill, Noida, 4th Edition, 15th Reprint, 2011, ISBN-13: 978-0-07-063546-3.

Reference Books:

1. Behrouz A. Forouzan and Richard F. Gilberg: “UNIX and Shell programming”, Cengage Learning, India, 1 st Edition, 2005, ISBN: 81-35-0325-9.
2. M G Venkatesh Murthy: “UNIX and Shell programming”, Pearson Education, Delhi, 1st Edition, 2005, ISBN: 81-7758-745-5.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/ Cos	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0401	CO1	3	3	3	0	0	0	1	2	3	3
	CO2	3	3	2	2	0	0		2	3	1

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

Course Code	**Complex Analysis**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21MTS411		SC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students to learn the complex analysis and applications of line integrals, Cauchy‟s in equality and Residue theorem.

Course Outcomes:

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

1. Analyze the conjugate and modulus of a complex number.
2. Apply the concepts of Cauchy-Riemann equations in Cartesian and polar forms to solve the problems.
3. Apply Cauchy integral theorem and its consequences to solve the problems.
4. Analyze the power series expansion of an analytic function.

Course Contents:

UNIT-I: Complex Analysis – 1

Recapitulation of Complex numbers, the complex plane, conjugate, and modulus of a complex number. Polar form, Euler‟s formula. Hyperbolic functions -simple problems.

UNIT-II : Complex Analysis – 2

Functions of complex variables: Limit, continuity, and differentiability-Simple problems. Analytic functions, Cauchy-Reimann equations in Cartesian and polar forms. Sufficient conditions for analyticity (in Cartesian form). Properties- Harmonic and orthogonal system and problems. Construction of analytic function, given real and imaginary parts.

UNIT-III: Complex analysis – 3

The complex line integral: Examples and properties (definitions of the concepts like neighborhood of a point, closed contour, etc. at appropriate places should be mentioned). Cauchy‟s integral theorem (with proof) and its consequences. Cauchy‟s integral formulae for the function and derivatives (with proof). Applications to the evaluation of simple line integrals. Cauchy‟s inequality, Liouville‟s Theorem-Fundamental theorem of algebra.

UNIT-IV: Complex analysis – 4

Power series expansion of an analytic function, Taylor‟s and Laurent‟s series (without proof). Singularity poles, residues, formula for the residue at a pole and Cauchy‟s Residue theorem (with proof) problems.

References

1. S. Shanthinarayan, Complex Analysis, S Chand Co. Pvt. Ltd., 2012.
2. R.V. Churchil & J W Brown, Complex Variables and Applications, 5th ed. TMH 1989.
3. L.V. Ahlfors, Complex Analysis, 3rd ed.: Mc Graw Hill, 1979.
4. A.R. Vashista, Complex Analysis, Krishna Prakashana Mandir, 2012.
5. Richard R Goldberg, Methods of Real Analysis, Indian ed. New Delhi, India: O&IBH Publishing Co. 1970.
6. G K Ranganath, Text book of B.Sc. Mathematics, Revised ed. New Delhi, India: S Chand Company Ltd., 2011.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MTS411	**CO1**	3	3	2	2					2	3
	CO2	3	2	2	3					3	2
	CO3	3	2	3	2					3	2
	CO4	3	3	3	2					3	3

Course Code	Operations Research	Type	L	T	P	C	Hrs/Week
B21MTS412		SC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students to:

1. Make the students to know about the history of operations research.
2. Make the students to learn about operations research models.
3. Make the students to formulate linear programming model.
4. Illustrate about the application areas of linear programming.

Course Outcomes:

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

1. Explain the classification of operations research models.
2. Demonstrate different methods for solving operations research models.
3. Gain knowledge on linear programming model formulation, applications and limitations.
4. Master on the applications of linear programming.

Course Contents:

UNIT-I: Operations Research Introduction

History-Features of operations research approach-Operations research approach to problem solving-Models and modeling in operations research-Classification based on structure-Classification based on function-Classification based on time – Classification based on degree of certainty-Classification based on method of solution or quantification.

UNIT-II : Operations Research Models

Advantages of model building-Methods for solving operations research models-Methodology of operations research-Advantages of operations research study-Opportunities and shortcomings of the operations research approach-Features of operations research solution-Applications of operations research-Operations research models in practice-Computer software for operations research.

UNIT-III: Linear Programming

General structure of an LP model-Assumptions of an LP model-Advantages of using LP-Limitations of LP-Application areas of LP-General mathematical model of LPP-LPP model formulation.

UNIT-IV: Applications of Linear Programming

LP model on production- LP model on Marketing- LP model on Finance- LP model on Agriculture-LP model on Transportation-LP model on personnel.

References

1. Operations Research by J.K. Sharma
2. Operations Research by S.D. Sharma
3. Operations Research by Sreenivasa Reddy M
4. Operations Research an Introduction by Hamdya.Taha
5. Linear Programming Methods and Applications by Saul I. Gass
6. A First Course in Optimization Theory by Rangarajan K Sundaram

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MTS412	**CO1**	3	3	2	2					2	3
	CO2	3	2	2	3					3	2
	CO3	3	2	3	2					3	2
	CO4	3	3	3	2					3	3

Course Code	Topology	Type	L	T	P	C	Hrs/Week
B21MTS413		SC	3	0	0	3	4

Course Objectives:

The aim of the course is to provide for the students an introduction to theory of metric and topological spaces with emphasis on those topics that are important to further studies. The course focuses on Homotopy, Homology theories and Topological groups and Lie groups.

Course Outcomes:

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

1. Analyse different axioms of Topology.
2. Learn Homotopy Theory.
3. Analyse fundamental groups of S1 and Sn.
4. Analyse Topological groups and Lie groups.

Course Contents:

UNIT-I:

General Topology: Introduction, metric topology, separation axioms, compactness, Connectedness, product topology, introduction to manifolds, sub manifolds.

UNIT-II :

Homotopy Theory. Covering spaces, homotopy maps, homotopy equivalence, Contractible spaces, deformation retraction.

UNIT-III:

Fundamental Groups: Universal cover and lifting problem for covering maps, Fundamental groups of S1 and Sn. Introduction to Homology Theory.

UNIT-IV:

Topological Groups: Introduction, integration on locally compact spaces, Haar Measure, Character groups, group action. Lie groups and lie algebras: Basic theory, linear groups.

References

1. C.O. Christenson and W.L. Voxman. Aspects of Topology.
2. J.R. Munkres. General Topology.
3. I.M. Singer and J.A. Thorpe. Lecture Notes in Elementary Topology and Geometry.
4. K. Chandrasekharan. A Course on Topological Groups.
5. W. Fulton and J. Harris. Representation Theory.
6. F.W. Warner. Foundations of Differentiable Manifolds and Lie Groups.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MTS413	**CO1**	3	3	2	2					2	3
	CO2	3	2	2	3					3	2
	CO3	3	2	3	2					3	2
	CO4	3	3	3	2					3	3

Course Code		Type	L	T	P	C	Hrs/Week
B21PTM401	**Soft Skill Training**	MC	0	0	0	0	2

Note: Soft Skill Training courses are organised by the **Placement and Training Centre**. The students have to undergo Soft Skill Courses conducted by the said Centre.

Course Code		Type	L	T	P	C	Hrs/Week
B21SHM401	**Skill Development Program**	MC	0	0	0	0	2

Note: Soft Skill Training courses are organised by the **Placement and Training Centre**. The students have to undergo Soft Skill Courses conducted by the said Centre.

Course Code		Type	L	T	P	C	Hrs/Week
B21MT0402	**Mathematics Practicals-IV**	HC	0	0	1.5	1.5	3

Course Objectives:

This course aims to provide for the students:
1. Theories on rings, integral domains and fields using *Python*.
2. Basic concepts of abstract algebra through *Python.*

Course Outcomes:

After successful completion of this course, the student will be able to:
1. Exhibit proficiency in using *Python* to study abstract algebra.

2. Obtain knowledge in abstract algebra and calculus.
3. Demonstrate the use of *Python* to understand and interpret the core concepts in integral calculus.
4. Demonstrate the use of *Python* to understand and interpret the core concepts in vector integration.

Course Contents:

List of programms:

1. Examples on different types of rings.
2. Examples on integral domains and fields.
3. Examples on subrings, ideals and subrings which are not ideals.
4. Homomorphism and isomorphism of rings- illustrative examples.
5. Python program to find equation and plot sphere, cone, cylinder.
6. Evaluation of the line integral with constant limits.
7. Evaluation of the double integral with constant limits.
8. Evaluation of the triple integral with constant limits.
9. Evaluation of the line integral with variable limits.
10. Evaluation of the double integral with variable limits.
11. Evaluation of the triple integral with variable limits.
12. Green‟s theorem.

Textbooks:

1. Farukh Khalilov and Tayyip oral, Math coding Python, 5th Edition, USA-2020.
2. Joakim Sundnes, Introduction to Scientific programming with Python, 2nd Edition, Springer 2010.
3. Allen Downey and Jeffrey Elkner, Learning with Python, 5th Edition, Springer, 2015.
4. Eric Matthes, A Hands-On, Project-Based Introduction to Programming- Python Crash Course, 2nd Edition:
5. Al Sweigart, Automate The Boring Stuff With Python: Practical Programming For Total Beginners, 2nd Edition.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0402	**CO1**	3	2	2	2				1	3	2
	CO2	3	2	2	2				1	3	3
	CO3	3	2	2	2				1	3	2
	CO4	3	2	2	2				1	2	2

Course Code	Physics Practicals-IV	Type	L	T	P	C	Hrs/Week
B21PH0402		HC	0	0	1.5	1.5	3

Course Objectives:

This course aims to provide for the students to:

1. Develop experimental skills and study practical applications of electricity and magnetism

2. Create and describe series and parallel LCR circuits
3. Study and analyse application of Ballistic galvanometer and CRO
4. Describe the properties of magnetism by plotting B-H Curve.

Course Outcomes:

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

1. Draw frequency response of circuits containing R, L and C components.
2. Verify the laws combination of capacitors
3. Design low pass and high pass filters for different frequency and quality factor.
4. Draw magnetic hysteresis and find coercive field and hysteresis loss

Course Contents:

Any **Eight** of the Following Experiments:

1. Determination of the self-inductance of the coil (Anderson's bridge)
2. Verification of laws of combination of capacitances (de-Sauty bridge).
3. To identify the components using Black box experiment.
4. B-H using Helmholtz double coil galvanometer and potentiometer.
5. Determination of C, Q-factor, and resonance frequency by LCR series circuit.
6. Voltage triangle - Measurement of phase difference
7. Determination of the cut-off frequency by Low and High pass filters.
8. Determination of L, Q-factor, and resonance frequency by LCR parallel circuit.
9. To verify the magnetic field at the center and at the edges by Solenoid experiment.
10. Determination of voltage and frequency using CRO.

Textbooks:

1. Thiruvadigal, J. D., Ponnusamy, S. Sudha. D. and Krishnamohan M., “Physics for Technologists”, Vibrant Publication, Chennai, 2013
2. R. K. Shukla and Anchal Srivastava, “Practical Physics”, 1st Edition, New Age International (P) Ltd, New Delhi, 2006.

Reference Books:

1. G. L. Souires, “Practical Physics:”, 4th Edition, Cambridge University, UK, 2001.
2. D. Chattopadhyay, P. C. Rakshit and B. Saha, “An Advanced Course in Practical Physics”, 2nd ed., Books & Allied Ltd., Calcutta, 1990.
3. An Advanced Course in Practical Physics, D Chattopadhyay, P C Rakshit, B Saha, New Central Book Agency (P) Limited, Kolkata, Sixth Revised Edition, 2002.
4. BSC, Practical Physics, CL Arora, S. Chand & Co, New Delhi, Revised Edition, 2007.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0402	**CO1**	3	2	1	1			1	3	3	2
	CO2	3	2	3	2				2	3	2
	CO3	3	3	3	3			2	3	3	3
	CO4	3	2	2	2			2	2	3	2

Course Code	**Unix Shell Programming Lab**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21CP0402		HC	0	0	1.5	1.5	3

Course Objectives:

1. learn editors available in UNIX and the detailed working on the most Vi editor To implement shell programming, wild cards and how to write simple shell programs, introduce concepts of decision control, looping, nested looping and control flow clauses in shell programming
2. Learn command structure of UNIX, various types of commands and familiarize students with some general commands.
3. Directory and file related commands, filters
4. Process related and user communication related commands in UNIX.

Course Outcomes:

1. Understand the basic commands of Linux operating system and can write shell scripts.
2. Create file systems and directories and operate them.
3. Describe and apply various command line utilities.
4. Work with the file System and Write shell scripts.

Course Contents:

PART – A

1. Use of Basic UNIX Shell Commands: ls, mkdir, rmdir, cd, cat, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit
2. Write a shell script to generate and print the GCD and LCM of two integers.
3. To print all prime numbers between m and n (m<n).
4. Reverse a given number and check whether it is palindrome or not.
5. Shell script to find maximum and minimum of given set
6. To count the number of vowels in a given string.
7. To check whether a given string is a palindrome or not.
8. Write a menu driven program to calculate (i) Simple interest (ii) Compound interest
9. Write a shell script to count lines, words and characters in its input (do not use wc).
10. Shell script to display all the file permissions.

PART – B

During practical examination the External and Internal examiners may prepare exam question paper related to theory syllabus apart from Part-A. (A minimum of 10 Programs has to be prepared).

Mapping of Course Outcomes with programme Outcomes

Course Code	**POs/ COs**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**
B21CP0402	**CO1**	3	2	1	1	0	0	1	3	3	2
	CO2	3	2	3	2	0	0		2	3	2
	CO3	3	3	3	3	0	0	2	3	3	3
	CO4	3	2	2	2	0	0	2	2	3	2

FIFTH SEMESTER

Course Code	Mathematics-V	Type	L	T	P	C	Hrs/Week
B21MT0501		HC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. Understand the concepts in vector spaces and Linear Transformations.
2. Gain problems solving skills in solving vector spaces and linear transformations.
3. To provide students with an introduction to the field of numerical analysis.
4. The course aims to develop and apply problem solving skills through the introduction of numerical methods

Course Outcomes:

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

1. Understand concepts of vector space, subspace of a vector space, linear span, linear dependence, linear independence, dimension, basis and formally prove standard results related to these concepts.
2. Be familiar with Linear transformations and their corresponding matrices and understand the Rank and nullity concepts
3. Use information and communication technology to discuss problems relevant to Numerical Analysis.
4. Demonstrate the ability to study the solution of a differential equation and develop a practical interpretation of the numerical results.

Course Contents:

UNIT-I: Vector space-I

Vector Spaces – Definition – Examples – Vector subspaces – Criterion for a subset to be a subspace – Algebra of Subspaces – Linear Combination– Linear Span – Linear dependence and linear Independence of vectors – Theorems on linear dependence and linear independence – Basis of a vector space – Dimension of a vector space – Some properties – Quotient spaces–Homomorphism of vector spaces– first kind of Isomorphism of vector spaces.

UNIT-II: Vector space-II

Linear transformation – Linear maps as matrices – Change of basis and effect of associated matrices – Kernel and image of a linear transformation – Rank and nullity theorem.

UNIT-III: Numerical Methods-I

Numerical solutions of Algebraic and transcendental equations – Bisection method – The method of false position – Newton – Raphson method. Numerical solutions of first order differential equations Picard‟s method– Euler‟s method – Euler‟s modified method – Runge -Kutta fourth order method.

UNIT-IV: Numerical Methods-II

Forward and backward differences – shift operator – Interpolation – Newton – Gregory forward and backward interpolation formulae –Divided difference, Newton‟s general interpolation formula, Lagrange‟s and Inverse Lagrange‟s interpolation formula.

Numerical differentiation: direct formulae and problems.

Numerical Integration: General quadrature formula – Trapezoidal Rule – Simpson"s 1/3 rule – Simpson"s 3/8 th rule, Weddle"s rule.

Textbooks:

1. G K Ranganath, Textbook of B.Sc. Mathematics, Revised ed. New Delhi, India: S Chand and Company Ltd., 2011.
2. S S Sastry, Introductory methods of Numerical Analysis, 3rd ed. New Delhi, India: Prentice Hall of India, 1999.
3. Francis Scheid, Schaum's Outline of Numerical Analysis, Revised ed.: Mc. Graw Hill., 2006.

Reference Book(s):

1. M K Jain, S R K Iyengar, and R K Jain, Numerical Methods for Scientific and Engineering Computation, 4th Ed. New Delhi, India: New Age International, 2003.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0501	**CO1**	3	3	3	2	3				3	2
	CO2	3	3	3	3	3				3	3
	CO3	3	3	2	3	2				3	2
	CO4	3	3	2	3	3				3	3

Course Code	Quantum Mechanics and Nuclear Physics	Type	L	T	P	C	Hrs/Week
B21PH0501		HC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. To have a clear understanding of the principles of quantum mechanics.
2. To know the application of Schrodinger wave equations and quantum concepts
3. Introduce students to the fundamental principles and concepts governing nuclear physics and working knowledge of their application to real-life problems.
4. Provide students with opportunities to develop basic knowledge and understanding of radioactivity decay.

Course Outcomes:

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

1. Understand the mathematical representations of particle properties of waves and analysis used in quantum mechanics.
2. Apply Schrodinger wave equation for one dimensional problem like particle in a box.
3. Explain radioactive decay using physics laws.
4. Apply basic knowledge of radio decay to solve nuclear physics related problems and decay systems in nuclear elements.

Course Contents:

UNIT-I: Theory of Relativity and Wave-Particle Dualism

Special theory of relativity: Postulates of the special theory of relativity; Lorentz Transformations – Length Contraction, Time Dilation, Velocity Addition Theorem; Variation of mass with velocity; Mass – Energy equivalence; Relativistic momentum and kinetic energy, Quantum Theory of Light, Photoelectric Effect, The Compton Effect (qualitative); Wave-Particle Duality of light, De-Broglie waves, Wave-Particle Duality of matter, de Broglie Wave Velocity, Wave packet, Phase and group velocities, Relations between phase, group and particle velocities, Wave function, Born's Interpretation of wave function, Probability density, Davison- Germer"s experiment, The Uncertainty principle and its applications, Numerical problems.

UNIT-II: Schrödinger's Equation and its Application

Introduction, Schrödinger"s Equation: Time dependent and Time independent wave equations, Conditions for Physical Acceptability of Wave Functions, normalization of wave function, Quantum Mechanical Operators, Expectation Values, Eigen values and Eigen functions, Particle in a one-dimensional box: energy quantization, wave functions, probability density, Numerical Problems.

UNIT-III: Nucleus and its Properties

Constituents of nucleus and their intrinsic properties. The proton-neutron hypothesis. Quantitative facts about size, mass, charge, nuclear density, angular momentum, magnetic dipole moment, nuclear spin, parity, and binding energy. Average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/Z plot and nuclear stability. Nuclear forces, Yukawa's theory (qualitative), characteristics of nuclear forces, Numerical Problems.

UNIT-IV: Nuclear Models and Radioactivity

Nuclear Models: Liquid drop model, Semi-empirical mass formula and significance of various terms, nuclear magic numbers and experimental evidence for nuclear magic numbers, basic assumption of shell model, explanation of magic numbers from nuclear shell model, Numerical Problems.

Radioactivity: Radioactivity, law of radioactive decay, half-life period and mean life. Successive disintegration, radioactive series, Alpha decay, Velocity, kinetic energy and Range of alpha-particle and their measurements, Geiger-Nuttal law, Nuclear potential barrier, Gamow"s theory of alpha-decay (qualitative). Beta Decay, Pauli"s neutrino hypothesis, neutrino and antineutrino, Gamma decay (qualitative), internal conversion, G.M. counter, inverse square law and absorption coefficient, Numerical Problems.

Books Recommended:

1. Concepts of modern physics, Arthur Beiser, 6thedition, TMH, New Delhi, 2008.
2. Modern Physics, R. Murugeshan, S. Chand & Co. XIth Revised edition, 2001.
3. Introduction to Quantum Mechanics, Ghatak, A, Macmillan India Ltd, 2000
4. Quantum Mechanics, Schiff, L. I., III Edition, McGraw Hill, 1968
5. Engineering Physics, S. P. Basavaraju, Subhas Publications, 2016
6. Nuclear Physics, 1st edition, S. N. Ghoshal, S. Chand and Co, 1994 (Reprint 2018).
7. Nuclear Physics, 2ndedition, Irving Kaplan, Narosa Publishing House, 1987 (Reprint 2002).
8. Introductory Nuclear Physics, K. S. Kranes, Wiley India, 2008.
9. Nuclear Physics, 5th edition, D. C. Tayal, Himalaya Publishing House, 2008.
10. Halliday D, Resnick R, and Walker J, Principles of Physics, 10th Edn., Wiley India Pvt. Ltd. (2013).

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0501	**CO1**	3	3	2	3	2				2	1
	CO2	3	3	2	3	2				3	3
	CO3	3	3	1	3	2				3	2
	CO4	3	3	2	3	2				3	3

Course Code	Basics of Web Programming	Type	L	T	P	C	Hrs/Week
B21CP0503		HC	3	0	0	3	4

Course Objectives:

1. Design the web page using HTML, PHP
2. Explain the concept of form handling and Java script.
3. Design a data base related web site.
4. Use PHP and HTML code for file handling and data base connectivity.

Course Outcomes:

1. Apply a structured approach to identifying needs, interests, and functionality of a website.
2. Gain knowledge on XHTML, JavaScript and other programming tools.
3. Develop website with basic HTML, CSS and PHP, Javascript programming.
4. Write well-structured, easily maintained, standards-compliant CSS code to present HTML pages in different ways.

Course Contents:

UNIT – I

Introduction to HTML 12 Hrs

HTML Documents - Dividing the document into 2 parts(Headers tags Body tags), Paragraphs, Formatting‟s, Elements of an HTML Document - Text Elements ,Tag Elements, Special Character elements, Image tags, HTML Table tags, Lists(Numbered list, Non-Numbered lists, Definition lists), Anchor tag, Name tag , Hyperlinks - FTP/HTTP/HTTPS, Links with images and buttons, Links to send email messages, Text fonts and styles, background colors /images, Marquee Behaviour, Forms related tags (action, method, name, input, submit etc), Lab components

UNIT – II

CSS, Form Handling, and JavaScript 12 Hrs

CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms.

Form Handling: Introduction, Creating Forms in HTML,GET and POST, Accessing Form data, $_POST, $_GET, $_REQUEST, Handling the file upload, Saving the uploaded file, Restricting the file type/size, Checking for errors, File inclusion.

JavaScript: Introduction JavaScript, HTML DOM, JavaScript Data type, Loops in JavaScript, Functions in JavaScript, Embedding JavaScript in HTML, Lab components

UNIT – III

PHP Basics 12 Hrs

Introduction to PHP, Support for Database, PHP Installation, Working with PHP, Why PHP?, Basic Syntax of PHP, PHP statement terminator and case insensitivity, Embedding PHP in HTML, Comments, Variables, Assigning value to a variable, Constants, Managing Variables.

Operators: Arithmetic Operators, Bit-wise Operators, Comparison Operators, Logical Operators, Concatenation Operator, Incrementing/Decrementing Operator, Ternary Operator, Operator Precedence, String Manipulation: strtoupper(), strtolower(), ucfirst(), ucwords(), strcmp(), strlen(), substr(), trim().

Functions: Functions in PHP, User-Defined function, Function Definition, Function Call, Function with arguments, Function with return value, Call by value and call by references, Understanding variable scope, Global Variables, Static Variables, Include and Require, Built-in functions in PHP

UNIT – IV

Arrays 12 Hrs

Introduction to Array, Array in PHP, Creating an Array, Accessing Elements of an Array, Modifying Elements of an Array, Finding the Size of an Array, Printing an Array in the readable way, Iterating Array Elements, Modifying Array while iteration, Iterating Array with Numeric index, Removing Element from an Array, Converting an Array to String, Converting String to an Array, Array Sorting, Multidimensional Array, Accessing elements of a Multidimensional Array, Iterating Multidimensional Array.

PHP File Handling

Introduction, File Open, File Creation, Writing to files, Reading from File, Searching a record from a file, closing a File, Using PHP with HTML Forms.

Text Books:

1. PHP Bible - Tim Converse, Published by John Wiley and Sons (2000).
2. PHP A beginners guide - Bill McCarthy, McGraw-Hill Education; Annotated edition (16 August 2001).
3. PHP and MySQL Web Development - Luke Welling, Addison-Wesley; 5th edition (10 November 2016).

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0503	CO1	1	0	0	3	2	2	2	2	1	3
	CO2	2	1	1	3	1	1	1	1	1	3
	CO3	3	1	2	2	3	0	1	2	2	3
	CO4	2	2	2	2	1	0	3	1	2	3

Course Code	Astronomy and Astro Physics	Type	L	T	P	C	Hrs/Week
B21PHS511		SC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. To provide basic knowledge to understand the stellar Physics.
2. To understand the formation of Milky Way.
3. To understand the solar system.
4. To understand the cosmology and big bang theory.

Course Outcomes:

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

1. Describe the aspects of stellar Physics.
2. Explain the formation of galaxy and origin of solar system.
3. Compare different solar systems.
4. Explain the aspects of cosmology.

Course Contents:

Unit-I:

Astronomical scales: Astronomical distance, mass, and time; scales; brightness, radiant flux and luminosity, measurement of astronomical quantities astronomical distances, stellar radii, masses of stars, stellar temperature. Basic concepts of positional astronomy - celestial sphere, geometry of a sphere, spherical triangle, astronomical coordinate systems, geographical coordinatesystems, Univ. of horizon system, equatorial system, diurnal motion of the stars, conversion of coordinates. Measurement of time - sidereal time, apparent solar time, mean solar time, equation of time, calendar the Julian date and its importance in astronomical observation.

Unit-II:

Basic parameters of stars- determination of distance by parallax method; brightness, radiant flux and luminosity, apparent and absolute magnitude scale, distance modulus. Numerical problems.

Stars: Surface or effective temperature, and color of a star. Intrinsic temperature of a star. Expression for average temperature, core temperature and core pressure of a star based on the linear density model of a star. Numerical problems.

Unit-III:

Stellar characteristics: Spectral classification, Edward Charles Pickering classification (i.e., OBAFGKM), Harvard sequence, and Yerke's luminosity classification. Size (radius) of a star. Expression for radius using Stefan‟s-Boltzmann law. Spectral signature of elements presents in the stellar atmosphere. Mass luminosity relationship and expression for lifetime of a star. Color index HD classification and HR diagram. Main sequence stars and their general characteristics.

Unit-IV:

The stellar evolution. The evolutionary track of stars - Protostars, premain sequence stars, main sequence stars. Evolution of a star to white dwarf stage through red giant stage. Supernova explosion. Formation of a pulsar or neutron star and black hole (qualitative).

Cosmology: Basic assumptions and limitations of cosmology; Expansion of the Universe and its evidence; Hubble's Law: Big bang theory and thermal history of the universe. Size and age of the universe.

References

1. Carroll B W, and Ostlie D A, Modern Astrophysics, 2nd Edn., Addison-Wesley (2007).
2. Zeilik M, and Gregory S A, Introductory Astronomy and Astrophysics, 4th Edn., Saunders College Publishing (2009).
3. Shu F, The Physical Universe: An Introduction to Astronomy, 1st Edn., University Science Books (1982).
4. Karttunen H, Kroger P, Oja H, Poutanen M, and Donner K J, Fundamental Astronomy, 4th Edn., Springer (1987) Univ.
5. Krishnasamy K S, Astrophysics: A Modern Perspective, Reprint, New Age International (2006).
6. Basu B, An Introduction to Astrophysics, Second Printing, Prentice Hall of India (2001).
7. Bhatia V B, Textbook of Astronomy and Astrophysics with Elements of Cosmology, Alpha Science International (2001).

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PHS511	CO1	3	3	2	1	1				3	3
	CO2	3	3	2	1	1				3	3
	CO3	2	2	2	1	1				3	3
	CO4	3	2	2		1				3	3

Course Code	Nano Materials	Type	L	T	P	C	Hrs/Week
B21PHS512		SC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. To understand the fundamental concepts behind nanoscience and nanotechnology.
2. To familiarize with various processing techniques available for synthesis of nanostructure materials.
3. To acquire the knowledge of various nanomaterial characterization methods.
4. To get familiarized with the various analytical techniques.
5. To understand the properties of nanomaterials.

Course Outcomes:

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

1. Analyse the fundamental principles of nanotechnology and apply to different applications
2. Apply physics concepts to the nanoscale and non-continuum domain.

3. Demonstrate state-of-the-art nano-fabrication methods to prepare nano particles
4. Evaluate processing conditions to functional nanomaterials for current constraints, such as regulatory, ethical, political, social, and economical encountered when solving problems in living systems.

Course Contents:

UNIT I:
Nanoscale systems: Length scales in physics. Nanostructures – 0D, 1D, 2D, and 3D nanostructures (nanodots, thin films, nanowires, nanorods), Band structure and density of states of materials at nanoscale, Size effects in nano systems, Quantum confinement: Applications of Schrodinger equation - Quantum confinement of carriers in 3D, 2D, 1D nanostructures and its consequences.

UNIT–II:
Synthesis of nanostructure materials: Top down and Bottom-up approach, Photolithography. Ball milling. Gas phase condensation. Vacuum deposition. Physical vapor deposition (PVD): Thermal evaporation, E-beam evaporation, Pulsed laser deposition. Chemical vapor deposition (CVD). Sol-Gel. Electro deposition. Spray pyrolysis. Hydrothermal synthesis. Preparation through colloidal methods. MBE growth of quantum dots.

UNITS–III:
Characterization: X-Ray Diffraction. Optical Microscopy. Scanning Electron Microscopy. Transmission Electron Microscopy. Atomic Force Microscopy. Scanning Tunneling Microscopy.

UNIT–IV:
Nano materials and properties: Carbon nano tubes properties, Metal oxide properties (titanium oxide, zinc oxide), Metal nano particles (Gold and silver nano particles), Size dependent properties - Mechanical, physical, and chemical properties.

References

1. Poole Jr P C, Owens F J, Introduction to Nanotechnology, Wiley India, 2003.
2. Kulkarni S K, Nanotechnology: Principles and Practices, Capital Publishing Company, 2015.
3. Chattopadhyay K K, and Banerjee A N, Introduction to Nanoscience and Technology, PHI Learning, 2009.
4. Booker R, and Boysen E, Nanotechnology, John Wiley, and Sons, 2005.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PHS512	CO1	1	1	2	2	2				2	2
	CO2	2	1	2	2	2				2	2
	CO3	3	1	2	2	2				2	2
	CO4	3	1	2	3	3				2	2

Course Code	Optoelectronics	Type	L	T	P	C	Hrs/Week

B21PHS513		SC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. To provide knowledge about optical fibres and applications.
2. To explain the basic components integrated optics, ex: optoelectronic devices.
3. To demonstrate different tools and fundamental concepts in signal processing.
4. To understand the modelling of photonics crystals.

Course Outcomes:

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

1. To apply optics and physics of materials knowledge in demonstrating optoelectronic devices
2. To understand and demonstrate usage of different tools integrated optoelectronic devices
3. To demonstrate signal processing
4. To Explain the modelling and properties of photonic crystals.

Course Contents:

UNIT -I:

Optical process in a semiconductor: Electron-hole pair formation and recombination, absorption in semiconductor direct and indirect band gap semiconductors, effect of electric field on absorption, Franz-Keldysh effect in semiconductors.

UNIT -II:

Optoelectronic devices: Light Emitting Diodes - Materials for light emitting diodes, Principle of action of LED, expression for light power in terms of photon energy, homo structured LED, and Heterojunction LED. Types of LED structures- planar, dome type, surface emitter, edge emitter, super luminescent structure, Performance characteristics of LED - Optical output power-current characteristics, forward current voltage characteristics, Modulation bandwidth, power bandwidth product, Lifetime, Rise time/fall time, reliability, Internal quantum efficiency, advantages / disadvantages of using LED. Numerical problems.

UNIT -III:

Organic optoelectronic devices: Organic light emitting diodes (OLED), The principle of OLED, characterization, structure, efficiency, multilayer OLED.

Photo detectors: Important parameters of photodetectors, Detector responsivity, spectral response range, response time, quantum efficiency, capacitance, noise characteristics, Absorption of radiation - absorption coefficient, mention of expression for photocurrent, long wavelength cut off, direct and indirect absorption.

UNIT -IV:

Types of photodiodes - Junction photodiodes, pin diode, avalanche photodiodes, CCD photodetectors; Comparison of different detectors, Photomultiplier tubes, Phototransistors – characteristics, Photo conductive detectors- expression for photoconductive gain, Numerical problems.

Photovoltaic devices: Solar cell - IV characteristics, efficiency, material, Organic photovoltaic diodes (OPVD)|fundamental process, exciton absorption, exciton dissociation, charge transport, charge collection, characterization. Numerical problems.

Books for Reference:

1. Keiser G, Optical Fibre Communications, 3rd Edn., McGraw Hill, 2000.
2. Agarwal D C, Fibre Optic Communication, 2nd Edn., Wheeler Publications, 1996.
3. Katiyar S, Optical Communication, 1st Edn., S K Kataria and Sons, 2010.
4. Kasap S O, Optoelectronics and Photonics: Principles and Practices, 2nd Edn., Pearson, 2013.
5. Wilson J and Hawkes J F B, Optoelectronics: An Introduction, 3rd Edn., Prentice Hall, 1998.
6. Pallab Bhattacharya, Semiconductor Optoelectronic Devices, 2nd Edn., Prentice Hall, 1997.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PHS513	**CO1**	1	2	2	2	2				2	2
	CO2	2	2	2	2	2				2	2
	CO3	1	2	2	2	2				2	2
	CO4	1	2	3	3	3				2	2

Course Code	**MOOC/SWAYAM**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21SHON01		SC	2	0	0	2	2

MOOC/ SWAYAM:

Globally, MOOC (Massive Open Online Course) platforms are gaining much popularity. Considering the popularity and relevance of MOOCs, Government of India has also launched an indigenous platform, SWAYAM. SWAYAM (Study Webs of Active Learning for Young Aspiring Minds) is basically an integrated MOOCs platform for distance education that is aimed at offering all the courses from school level (Class IX) to post-graduation level. The platform has been developed collaboratively by MHRD (Ministry of Human Resource Development) and AICTE (All India Council for Technical Education) with the help of Microsoft and is capable of hosting 2,000 courses. There are many other international agencies, foreign universities offering OOC courses.

A student shall register and successfully complete any of the courses available on SWAYAM. Student shall inform the MOOC/SWAYAM coordinator of the school about the course to which he/she has enrolled. The minimum duration of the course shall be not less than 40 hours and of 4 credits. The student should submit the certificate issued by the SWAYAM to the

MOOC/SWAYAM coordinator of the school, the grades obtained in the course shall be forwarded to concerned authority of the University.

Course Code	Skill Development Program	Type	L	T	P	C	Hrs/Week
B21SHM501		MC	0	0	0	0	2

Note: Soft Skill Training courses are organised by the **Placement and Training Centre**. The students must undergo Soft Skill Courses conducted by the said Centre.

Course Code	Mathematics Practicals-V	Type	L	T	P	C	Hrs/Week
B21MT0502		HC	0	0	1.5	1.5	3

Course Objectives:

This course aims to provide for the students:

1. To provide students with an introduction to the field of numerical analysis.
2. Aside from developing competency in the topics and emphases listed, the course aims to develop and apply problem solving skills through the introduction of numerical methods.

Course Outcomes:

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

1. Demonstrate the use of *Python* to understand to find whether vectors are dependent or independent.
2. Exhibit proficiency in using *Python* to basis and dimension of vector space.
3. Acquire proficiency in using *Python* to study Numerical differentiation.
4. Acquire proficiency in using *Python* to study Numerical integration.

Course Contents:

List of Programs:

1. i) Vector space, subspace – illustrative examples. ii) Expressing a vector as a linear combination of given set of vectors.
2. Examples on linear dependence and independence of vectors.
3. Basis and Dimension – illustrative examples.
4. Verifying whether a given transformation is linear.
5. Finding matrix of a linear transformation.
6. Problems on rank and nullity.
7. Programs on Interpolations with equal intervals.
8. Programs on Interpolations with unequal intervals.
9. Programs to find derivatives with equal intervals.
10. Programs to evaluate integrals using Simpson"s 1/3rd and 3/8th rule.

Reference Books:

1. Farukh Khalilov and Tayyip oral, Math coding Python, 5th Edition, USA-2020.
2. Joakim Sundnes, Introduction to Scientific programming with Python, 2nd Edition, Springer 2010.
3. Allen Downey and Jeffrey Elkner, Learning with Python, 5th Edition, Springer, 2015.
4. Eric Matthes, A Hands-On, Project-Based Introduction to Programming- Python Crash Course, 2nd Edition:

5. Al Sweigart, Automate The Boring Stuff With Python: Practical Programming For Total Beginners, 2nd Edition.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0502	**CO1**	3	3	2	2					2	3
	CO2	3	2	2	3					3	2
	CO3	3	2	3	2					3	2
	CO4	3	3	3	2					3	3

Course Code	Physics Practicals-V	Type	L	T	P	C	Hrs/Week
B21PH0502		HC	0	0	1.5	1.5	3

Course Objectives:

This course aims to provide for the students:

1. To make the students gain practical knowledge to co-relate with theoretical laws of quantum mechanics and nuclear physics.
2. To achieve perfectness in experimental skills and analyzing the experimental data that will bring more confidence and understanding of the concepts.
3. Design of circuits using new technology and latest components to study practical applications of advanced materials.
4. Study and analyze the applications of the Geiger-Muller (G. M.) counter.

Course Outcomes:

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

1. Determine the few physical constants through experiments.
2. Estimate the e/m value of an electron.
3. Demonstrate various experiments related to nuclear radiation counting and measuring half-life period of radioactive sources.
4. Verify various physics principle/theorems through experiments.

Course Contents:

List of Experiments:

1. Determination of Planck‟s constant using light emitting diodes (LEDs).
2. Determination of particle size using LASER diffraction halos method.
3. Determination of Rydberg constant of Hydrogen spectra using gas discharge tube.
4. Measuring the ionization potential of mercury gas.
5. Determination of e/m of an electron using a bar magnet (Thomson effect).
6. Verification of inverse square law for gamma-rays.
7. Measurement of half-life period of a radioactive source (K 40).
8. Measuring the absorption coefficient of gamma-rays.
9. Study the characteristics of GM-tube.
10. Determination of Planck‟s constant using color filters.

Textbooks:

1. Thiruvadigal, J. D., Ponnusamy, S. Sudha. D. and Krishnamohan M., "Physics for Technologists", Vibrant Publication, Chennai, 2013.
2. R. K. Shukla and Anchal Srivastava, "Practical Physics", 1st Edition, New Age International (P) Ltd, New Delhi, 2006.

Reference Books:

1. G. L. Souires, "Practical Physics:", 4th Edition, Cambridge University, UK, 2001.
2. D. Chattopadhyay, P. C. Rakshit and B. Saha, "An Advanced Course in Practical Physics", 2nd ed., Books & Allied Ltd., Calcutta, 1990.
3. Advanced Practical Physics for Students – Workshop & Flint, Methuen & Co, London, 1923.
4. Practical Physics – S. L. Gupta & V. Kumar, Pragati Prakashan, 2002.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0502	**CO1**	3	3	3	2					2	3
	CO2	3	3	3	2					3	3
	CO3	2	2	1	3					3	2
	CO4	3	2	3	1					2	2

Course Code	Web Programming Lab	Type	L	T	P	C	Hrs/Week
B21CP0502		HC	0	0	1.5	1.5	3

Course Objectives:

1.

Course Outcomes:

1. To develop interactive web pages using HTML, CSS and image map.
2. To procure the knowledge of information interchange formats like XML.
3. To validate fields of web pages using scripting languages like JavaScript.
4. To develop PHP programs using the concepts.

Course Contents:

1. Develop and demonstrate a XHTML document that illustrates the use external style sheet, ordered list, table, borders, padding, color, and the <span> tag.
2. Develop and demonstrate a XHTML file that includes Javascript script for the following:
   Input: A number n obtained using prompt
   Output: The first n Fibonacci numbers
3. Develop and demonstrate a XHTML file that includes Javascript script that uses functions for the following:
   Parameter: A stringOutput: The position in the string of the left-most vowel
4. Develop and demonstrate, using Javascript script, a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form

element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.

5. Write a PHP program to store current date-time in a COOKIE and display the „Last visited on‟ date-time on the web page upon reopening of the same page.
6. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
7. Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table. Retrieve and display the data based on Name.
8. Write a PHP program to check whether a number is positive, negative or zero.

PART B

1. Create, test, and validate an XHTML document for yourself, including your name, address, and e-mail address. If you are a student, you must include your major and your grade level. If you work, you must include your employer, your employer‟s address, and your job title. This document must use several headings and <em>, <strong>, <hr />, <p>, and <br /> tags.

2. Create a form for Employee information. Write JavaScript code to find DA, HRA, PF, TAX, Gross pay, Deduction and Net pay.
3. Create a form consists of a two Multiple choice lists and one single choice list
   a) The first multiple choice list, displays the Major dishes available.
   b) The second multiple choice list, displays the Starters available.
   c) The single choice list, displays the Soft drinks available.
4. Write a javascript code for case conversion
5. Write a program to create chess board in PHP using for loop
6. Write a PHP script to check whether a string contains a specific string?
7. Write a PHP script to calculate and display average temperature, five lowest and highest temperatures.
8. Write a code to:
   a) Set up an html page with a form using which we will upload the file.
   b) Setup a PHP script to upload the file to the server as well as move the file to it's destination.
   c) Inform the user whether the upload was successful or not.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0502	CO1	3	2	2	2	2	1	1	1	2	2
	CO2	3	3	2	2	3	1	1	1	2	3
	CO3	3	3	3	3	3	1	1	2	3	3
	CO4	1	3	2	3	2	2	2	3	2	3

SIXTH – SEMESTER

Course Code	Mathematics-VI	Type	L	T	P	C	Hrs/Week
B21MT0601		HC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. Gain familiarity in fundamental theories on Fourier Series and Laplace Transforms.
2. Acquire problem solving skills on Fourier Series and Laplace Transforms.

Course Outcomes:

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

1. Evaluate improper integrals using beta and gamma functions.
2. Understand Laplace transforms of different types of functions.
3. Apply Laplace transform method to linear differential equations.
4. Express given function in terms of sines ad cosines.

Course Contents:

UNIT-I:

Integral Calculus: Improper Integrals (definition only) – Gamma and Beta functions and results following the definitions – relation between Beta and gamma functions – Applications to evaluation of integrals – Duplication formula.

UNIT-II:

Laplace Transforms: Definition and basic properties – Laplace transforms of e^{kt}, $\cos kt$ $\sin kt$, t^n, $\cosh kt$ and $\sinh kt$. Laplace transform of $e^{at}f(t)$, $t^n f(t)$, $\frac{f(t)}{\square}$, Laplace transform of derivatives, Laplace transforms of integrals (without proof) and problems. Laplace transform of periodic functions, unit-step function and Unit impulse functions and problems.

UNIT-III:

Inverse Laplace transforms: Inverse Laplace transforms – problems. Convolution theorem (with proofs) problems (both evaluation and verification). Applications of Laplace transforms to solve simultaneous differential equations and linear order differential equations with constant coefficients.

UNIT-IV:

Fourier series: Introduction – Periodic functions – Fourier series and Euler formulae (statement only) – Even and odd functions – Half range series – Change of interval. Complex form of Fourier series.

Textbooks:

1. G K Ranganath, Textbook of B.Sc., Mathematics, Revised ed. New Delhi, India: S Chand and Co., 2011.
2. Raisinghania M D., Laplace, and Fourier Transforms. New Delhi, India: S. Chand and Co. Ltd., 1995.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 8th ed. New Delhi, India: Wiley India Pvt. Ltd., 2010.
2. Murray R, Spiegel L: Laplace Transforms (Schaum Series).
3. Raisinghania M.D., Laplace and Fourier Transforms. New Delhi, India: S. Chand and Co. Ltd., 1995.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0601	**CO1**	3	3	3	3			1	2	3	3
	CO2	3	3	3	3			1	2	3	3
	CO3	3	2	2	2			2	2	3	3
	CO4	3	2	2	2			2	2	3	3

Course Code	**Solid State Physics**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21PH0601		HC	3	0	0	3	4

Course Objectives:

This course aims to provide for the students:

1. To know the basic concepts of electricity and superconductivity as well as their potential applications.
2. To explain the underlying physics, explore the internal behaviour, working principles, and properties of solid-state materials and devices.
3. Introduce students to the fundamental principles and concepts governing statistical physics, dielectrics, and liquid crystals.
4. Provide students with opportunities to develop basic knowledge and understanding of X-ray diffraction.

Course Outcomes:

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

1. Apply the basic knowledge of electricity and superconductivity to solve physics related problems.
2. Explain the working of semiconductor and optoelectronic devices like Zener diode, Solar cells, Photodiode, and LED.
3. Explain the fundamental principles and concepts governing statistical physics, dielectrics, and liquid crystals.
4. Apply basic knowledge of X-ray diffraction to study and analyze the materials.

Course Contents:

UNIT-I: Electricity and Superconductivity

Electrical properties of metals: Band theory of solids - review, Free electron theory of metals - classical theory and quantum theory. Expression for electrical conductivity - Ohm's law, Wiedemann-Franz law. Density of states, Expression for Fermi energy. Hall effect and magnetoresistance in metals. Expression for Hall coefficient in metals. Numerical problems.

Superconductivity: Experimental observation of superconductivity, critical temperature (Tc), Meissner effect, Influence of external agents on superconductivity; Critical magnetic field (Hc), Critical current (Ic) and Critical current density (Jc), BCS theory (qualitative), Types of superconductors; type-I and type-II superconductors, Applications of superconductivity. Introduction to high temperature superconductors, Numerical problems.

UNIT-II: Semiconductors and Devices

Semiconductors: Concept of bands in solids. Intrinsic and extrinsic semiconductors. Depletion region, drift velocity, expression for electron and hole concentration in intrinsic semiconductor under thermal equilibrium. Derivation of the expression for electrical conductivity of intrinsic semiconductors; electron and hole mobilities; Expression for the energy gap; Hall effect in semiconductors. Numerical problems.

Semiconductor devices: Diode current equation, I-V characteristics, Expression for ripple factor and efficiency. Filters - Zener breakdown and avalanche breakdown. Phenomenon of photoconductivity, photovoltaic cells, LED, Hartley oscillator, Numerical problems.

UNIT-III: Statistical Physics, Dielectrics and Liquid crystals

Statistical physics: Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac energy distribution formulae (derivation). A qualitative comparison of the three distribution formulae.

Dielectrics: Dielectric materials (Ferro, Piezo and pyro); their properties. Method of determining dielectric constant for solids.

Liquid crystals: Symmetry, structure, and classification of liquid crystals; polymorphism in thermotropic.

UNIT-IV: X-ray diffraction

Bragg's law and the Bragg"s spectrometer. A brief mention of the different types of crystals. Miller indices, structure of NaCl and KCl crystals. Continuous X-ray spectrum and its origin, Duane, and Hunt limit. Characteristic X-ray spectra and its origin. Mosley law and its significance. Compton effect, Experimental set-up and explanation of Compton effect, Expression for Compton shift, Compton wavelength, Verification of change in wavelength. Reason for non-observance of Compton effect in visible light. Numerical problems.

Books for Reference:

1. Sedha R S, A Textbook of Applied Electronics, 2nd Edn., S Chand Limited (2007).
2. Theraja B L, and Sedha R S, Principles of Electronic Devices and Circuits, 2nd Edn., S. Chand Limited (2008).
3. Mehta V K, Principles of Electronics, 2nd Edn., S Chand and Company (2005).
4. Leach D P, Malvino A P, and Saha G, Digital Principles and Applications, 8thEdn., McGraw Hill (1993).
5. Beiser A, Mahajan S, Rai Choudhary S, Concepts of Modern Physics, 6th Edn., McGraw Hill (2009).

6. Eisberg R M, Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles,2nd Edn., Wiley India (2006).
7. Blackmore J B, Solid State Physics, 2nd Edn., Cambridge University Press (1998).
8. Dekker A J, Solid State Physics, Macmillan (1971).
9. Kittel C, Introduction to Solid State Physics, 7th Edn., Wiley (2008).

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0601	**CO1**	3	3	2	3	2				2	1
	CO2	3	3	2	3	2				3	3
	CO3	3	3	1	3	2				3	2
	CO4	3	3	2	3	2				3	3

Course Code	Data Mining and Data Warehousing	Type	L	T	P	C	Hrs/Week
B21CP0601		HC	3	0	0	3	4

Course Objectives:

1. To understand the scope and importance of Data mining in solving real-world problems.
2. To provide an understanding of the fundamental concepts of data mining and warehousing.
3. To examine the types of data to be mined and apply pre-processing methods on raw data.
4. To understand algorithm and tools of data mining used in real world problems.

Course Outcomes:

1. Analyze the concept of data warehouse and OLAP.
2. Demonstrate data pre-processing techniques.
3. Apply various Data Mining Techniques.
4. Analyze data mining applications in various field.

Course Content:

UNIT-I **12 Hrs**

Data Warehouse and OLAP

Introduction to Data warehouse Data warehouse Characteristics, Data warehouse Architecture and its Components, Extraction Transformation Loading (ETL), ETL Tools. Multidimensional view and Data cube, Introduction to OLAP, OLAP Operations, Difference between (OLTP) and (OLAP), Advantages of Data mining.

UNIT II **12 Hrs**

Introduction to Data Mining

Introduction to Data Mining: Challenges, Knowledge Discovery in database, Data Mining Tools and Applications, Data Pre-processing: Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT-III

Machine Learning Techniques **12 Hrs**

Machine Learning Techniques –Types of Machine learning, Supervised Learning: linear and polynomial Regression and Classification using Decision Trees & k-NN, Unsupervised learning: Association, K- Mean Clustering and Reinforcement Learning.

UNIT-IV

Applications of Data mining **12 Hrs**

Introduction, Business Applications Using Data Mining- Financial Data Analysis Retail Industry, Tele Communication Industry, Healthcare applications: Biological Data Analysis, Other Scientific Applications, Intrusion Detection.

Textbooks:

1. J. Han, M. Kamber, “Data Mining Concepts and Techniques”, Morgan Kaufmann
2. M. Kantardzic, “Data mining: Concepts, models, methods and algorithms, John Wiley &Sons Inc.
3. PaulrajPonnian, “Data Warehousing Fundamentals”, John Willey.

Reference Books:

1. Sam Anahory, Dennis Murray: Data Warehousing in the Real World, Pearson, Tenth Impression,2012.
2. Michael.J.Berry,Gordon.S.Linoff: Mastering Data Mining , Wiley Edition, second edtion,2012
3. M. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0601	CO1	-	-	2	3	2	2	2	2	-	2
	CO2	-	-	3	3	2	2	2	2	-	2
	CO3	-	-	2	2	3	2	3	2	-	3
	CO4	-	-	2	3	2	2	3	2	-	2

Course Code	Software Engineering	Type	L	T	P	C	Hrs/Week
B21CPS611		SC	3	0	0	3	4

Course Objectives:

1. To provide the knowledge of software engineering discipline.
2. To apply analysis, design & testing principles to software project development.
3. To demonstrate and evaluate real time projects with respect to software engineeringprinciples.

Course Outcomes:

1. Understand and demonstrate basic knowledge in software engineering.
2. Identify requirements, analyze and prepare models.
3. Plan, schedule and track the progress of the projects.
4. Design & develop the software projects.
5. Identify risks, manage the change to assure quality in software projects.
6. Apply testing principles on software project and understand the maintenance concepts.

Course Contents:

UNIT-1

SOFTWARE PROCESS MODELS 12 Hrs

Introduction to software engineering, Classification of Software, Software Development Life Cycle- Waterfall Model, Iterative Waterfall Model, Spiral Model, Incremental process Model, Rapid Application Development Model (RAD), Agile Development Model, SCRUM, Extreme Programming.

UNIT-2

SOFTWARE REQUIREMENT ANALYSIS AND SPECIFICATION 12 Hrs

Software Requirements- Requirements Engineering Process, Classification of Software Requirements, Eliciting Requirements, Developing Use Cases, Requirement Analysis and Modeling, Characteristics of a Good Software, Software Requirement & Specification Document (SRS).

UNIT-3

SOFTWARE PLANNING & SOFTWARE DESIGN 12 Hrs

Software Project Management (SPM)- Project Management Process, Project size estimation techniques, System Configuration Management (SCM), COCOMO Model, Capability Maturity Model (CMM), Risk Management in SDLC, Role and Responsibility of a Software Project Manager, Software Maintenance.

Software Design- Abstraction, Architecture, Patterns, Modularity, Information Hiding, Functional Independence- Cohesion & Coupling, Object Oriented Design- Data Design, Architectural Design, User Interface Design, Component Level Design.

UNIT-4

SOFTWARE TESTING & DEBUGGING 12 Hrs

Testing Fundamentals- Error, Fault & Failure, Black Box Testing- Equivalence Partitioning, Boundary value Analysis, White Box Testing- Control flow-based Testing, Data flow based Testing, Testing Strategies- Verification & Validation, Unit Testing, Integration Testing, System Testing, Acceptance Testing, Deriving Test Cases, Alpha and Beta Testing, Regression Testing, Performance Testing, Stress Testing, Debugging.

TEXTBOOKS:

1. R.E. fairly, "software engineering concepts", McGraw Hill.1997.
2. Rajib mall fundamentals of software engineering 4th edition phi 2014

REFERENCES:

1. R.S. Pressman, "Software Engineering" – A Practitioners approach – McGraw Hill.
"Software Engineering A Concise study" – Kelkar – PHI.
2. Pankaj Jalota: "An integrated approach to software engineering" - Narosa.
3. Prof. S.Parthasathy & Prof. B.W.Khalkar ,"System Analysis & Design & Introduction to S/W Engineering".

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CPS611	**CO1**	3	2	3	1					3	2
	CO2	2	2	3	1			3	2	2	3
	CO3	3	3	3	2	3	2	2	2	3	3
	CO4	2	2	3	3		2	3		3	2

Course Code	Cryptography and Network Security	Type	L	T	P	C	Hrs/Week
B21CPS612		SC	3	0	0	3	4

Course Objectives:

1. To understand basics of Cryptography and Network Security.
2. To be able to secure a message over insecure channel by various means.
3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
4. To understand various protocols for network security to protect against the threats in the networks.

Course Outcomes:

1. Classify various block ciphers and its usages.
2. Design various cryptographic algorithms that used for encryption and decryption purposes
3. Study different techniques used in key exchange protocols.
4. Discuss the applications of applied cryptography.

Course Contents:

UNIT I

Introduction to Cryptography and Block Ciphers 12 hours

Introduction to security attacks - services and mechanism - introduction to cryptography - Conventional Encryption: Conventional encryption model - classical encryption techniques - substitution ciphers and transposition ciphers – cryptanalysis – steganography - stream and blockciphers - Modern Block Ciphers: Block ciphers principals - Shannon‟s theory of confusion and diffusion - fiestal structure - data encryption standard(DES) - strength of DES - differential and linearcrypt analysis of DES - block cipher modes of operations - triple DES – AES.

UNIT II

Confidentiality and Modular Arithmetic 12 hours

Confidentiality using conventional encryption - traffic confidentiality - key distribution - random number generation - Introduction to graph - ring and field - prime and relative prime numbers - modular arithmetic - Fermat‟s and Euler‟s theorem - primality testing - Euclid‟s Algorithm - Chinese Remainder theorem - discrete algorithms.

UNIT III

Public key cryptography and Authentication requirements 12 hours

Principles of public key crypto systems - RSA algorithm - security of RSA - key management – Diffle-Hellman key exchange algorithm - introductory idea of Elliptic curve cryptography – Elgamel encryption - Message Authentication and Hash Function: Authentication requirements - authentication functions - message authentication code - hash functions - birthday attacks – security of hash functions and MACS.

UNIT IV

IP Security 12 hours

Overview of IP Security (IPSec); IP Security Architecture; Modes of Operation; Security Associations (SA) – Security Parameter Index (SPI), SA Management, Security Policy; Authentication Header (AH); Encapsulating Security Payload (ESP); Internet Key Exchange.

Web Security: Web Security Requirements; Secure Socket Layer (SSL) – SSL Architecture, SSL Protocol; Transport Layer Security (TLS); Secure Electronic Transaction (SET) – Features, Components, Dual Signature.

Textbooks:

1. William Stallings, “Cryptography and Network security Principles and Practices”, Pearson/PHI. 2001
2. Wade Trappe, Lawrence C Washington, “Introduction to Cryptography with coding Theory”, Pearson. 2000

Reference Books:

1. W. Mao, “Modern Cryptography – Theory and Practice”, Pearson Education.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India

Mapping of Course Outcomes with programme Outcomes

Course Code	**POs/ Cos**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**
B21CPS612	**CO1**	2	3	1	2	2	1	1	1	2	2
	CO2	1	2	2	2	3	1	1	1	2	3
	CO3	3	3	3	3	3	1	1	2	3	3
	CO4	2	3	2	3	2	3	2	1	3	3

Course Code	Project	Type	L	T	P	C	Hrs/Week
B21SH0601		HC	0	0	4	4	8

Course Objectives:

To carry out the research under the guidance of R&D supervisor/Industry/R&D Institution and in the process learn the techniques of research.

Course Outcomes:

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

1. Familiarize with literature search.
2. Conduct the experiments related to research and formulate computational techniques.
3. Interpret the scientific data.
4. Write report and defend the research findings.

Course Contents:

Project:

This project will be based on preliminary research-oriented topics both in theory and experiment. The teachers who will act as supervisors for the projects will float projects and any one of them will be allocated to the student. The research projects floated should be completed in 7-8 weeks. After the completion of the project the student shall submit project report in the form of dissertation on a specified date by the school. The details of assessment of project are explained under the heading “Evaluation of Minor Project/Dissertation” in this handbook.

Course Code	Mathematics Practicals-VI	Type	L	T	P	C	Hrs/Week
B21MT0602		HC	0	0	1.5	1.5	3

Course Objectives:

This course aims to provide for the students to:

1. Understand the concept of Laplace transform.
2. Familiarize with Inverse Laplace transforms.

Course Outcomes:

After successful completion of the course a student will be able to:

1. Problems on Laplace transform using *Python*.
2. Problems on inverse Laplace transforms using *Python*.
3. Acquire proficiency in using *Python* to evaluate improper integrals.
4. Acquire proficiency in using *Python* to study Fourier series

Course Contents:

1. Problems on gamma and beta functions.
2. Problems on duplication formula.
3. Problems on evaluation of improper integrals in applications.
4. Finding the Laplace transform.
5. Finding the inverse Laplace transform.
6. Problems on Convolution theorem

7. Laplace transform method of solving first order ordinary differential equations with constant coefficients.
8. Laplace transform method of solving second order ordinary differential equations with constant coefficients
9. To find full range trigonometric Fourier series of some simple functions with period 2π and 2L.
10. Finding the half-range sine and cosine series of simple functions and plotting them.

Textbooks:

1. Farukh Khalilov and Tayyip oral, Math coding Python, 5th Edition, USA-2020.
2. Joakim Sundnes, Introduction to Scientific programming with Python, 2nd Edition, Springer 2010.
3. Allen Downey and Jeffrey Elkner, Learning with Python, 5th Edition, Springer, 2015.
4. Eric Matthes, A Hands-On, Project-Based Introduction to Programming- Python Crash Course, 2nd Edition:
5. Al Sweigart, Automate The Boring Stuff With Python: Practical Programming For Total Beginners, 2nd Edition.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21MT0602	**CO1**	3	3	2	2			1	2	2	3
	CO2	3	2	2	3			1	2	3	2
	CO3	3	2	3	2			2	2	3	2
	CO4	3	3	3	2			2	2	3	3

Course Code	Physics Practicals–VI	Type	L	T	P	C	Hrs/Week
B21PH0602		HC	0	0	1.5	1.5	3

Course Objectives:

This course aims to provide for the students:

1. To make the students gain practical knowledge to co-relate with theoretical laws of solid-state physics.
2. To achieve perfectness in experimental skills and analyzing the experimental data that will bring more confidence and understanding of the concepts.
3. Design of circuits using new technology and the latest components to study practical applications of advanced solid-state materials and devices.
4. Study and determination of interplanar distances using X-ray photograph.

Course Outcomes:

After successful completion of the course a student will be able to:

1. Determine the electrical resistivity and energy gap of semiconducting materials.
2. Demonstrate various experiments related to solid-state electronics such as Solar cells, PN diodes, Photodiode and Hartley oscillator etc.
3. Estimate dielectric constant of a given material.
4. Determination of interplanar distances from X-ray photograph.

Prerequisites:

1. Measurement of resistivity of a semiconductor material using the Four probe method.
2. Determination of Energy gap of semiconductor by graphical method.
3. Determination of Fermi energy of metal (copper) by meter bridge method.
4. Study of I-V characteristics, fill factor & efficiency of a Solar cell.
5. Study of I-V Characteristics of Photodiode.
6. Determination of dielectric constant of a given solid.
7. Study the I-V characteristics and voltage regulator property of Zener diode.
8. Determination the value of Boltzmann constant using I-V characteristics of PN diode.
9. Study and analyze the wave form generated by Hartley Oscillator.
10. Determination of interplanar distances of NaCl using X-ray computerized photograph.

Textbooks:

1. Thiruvadigal, J. D., Ponnusamy, S.Sudha.D. and Krishnamohan M., "Physics for Technologists", Vibrant Publication, Chennai, 2013
2. R. K. Shukla and Anchal Srivastava, "Practical Physics", 1st Edition, New Age International (P) Ltd, New Delhi, 2006.

Reference Books:

1. G. L. Souires, "Practical Physics:", 4th Edition, Cambridge University, UK, 2001.
2. D. Chattopadhyay, P. C. Rakshit and B. Saha, "An Advanced Course in Practical Physics", 2nd ed., Books & Allied Ltd., Calcutta, 1990.
3. Advanced Practical Physics for Students – Workshop & Flint, Methuen & Co, London, 1923.
4. Practical Physics – S. L. Gupta & V. Kumar, Pragati Prakashan, 2002.

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21PH0602	**CO1**	3	3	3	2	2				2	3
	CO2	3	3	3	2	2				3	3
	CO3	2	2	1	3	2				3	3
	CO4	2	2	1	2	1				2	2

Course Code	**Machine Learning LAB**	**Type**	**L**	**T**	**P**	**C**	**Hrs/Week**
B21CP0602		HC	0	0	1.5	1.5	3

Course Objectives:

1. To demonstrate the analysis of given ore, alloy, phenol and biomolecules by titrimetric methods.
2. Exposure to prepare various standard soltutions using molarity and normality calculations.
3. Allow independently for the separation of organic compounds with the knowledge of TLC using colum 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 comounds using column chromatographic technique.
2. Estimate the quantitative analysis of organic and in organic 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.

Course Contents:

PART - B

1) Load the dataset from the below file and write python code to answer below exploratory analysis questions :

   a) How many observations are there in this dataset?
   b) How many various features are there in the dataset?
   c) How many different occupations (unique) are there in the dataset?
   d) What occupation is the most common.
   e) What is the average age of all the people in this dataset?
   f) What is the average age of people in each occupation group?
   g) What are the occupations of the youngest and oldest people in this dataset?

2) Load the dataset from the below file and write python code to answer below exploratory analysis questions:

   a) How many teams participated in this tournament?
   b) List top two teams with high discipline and bottom two teams with low discipline (you can consider red and yellow cards to calculate discipline)
   c) On an average, how many yellow cards are given per team
   d) How many teams that scored more than 5 goals and which are those teams
   e) Which team is most accurate in shooting?
   f) How many teams made more fouls than their opponents?

3) Use appropriate python library to plot the below using the below dataset
   a) Plot the monthly trend of various products as line charts in a single chart.
   b) Get total number of items sold (all products together) and plot them as a line chart to show the trend
   c) Find the relationship between product 2 and product 4 using scatterplot and record your observation
   d) Plot a stacked bar chart and grouped bar chart to show monthly trend in the product sales

4) Write python code for calculating various regression errors/error metrics such as SSE, MSE, RMSE and R2 score. The function should take actual target values and predicted targets from the model as input and return these error metrics as output

5) Create a regression model for the below dataset and predict insurance charges the user has to pay. Use appropriate model selection techniques and use the solution from above (question3) to calculate various error metrics for training and testing datasets and explain the findings.

6) Construct a ID3 decision tree model manually from the given dataset (use entropy or gini value as the criterion of impurity). Explain the steps. Also find the most important feature based on information gain.

7) Build a supervised classification model to predict the iris flower variety using the below dataset. Use appropriate algorithm and model selection techniques. Calculate various error metrics for training and testing datasets and explain the findings.

8) Write a python program to implement k-Nearest Neighbour algorithm to classify the iris data set. Use appropriate model selection techniques. Explain your findings with use of a confusion matrix.

PART - B

During practical examination the External and Internal examiners may prepare exam question paper related to theory syllabus apart from Part-A. (A minimum of 6 Programs has to be prepared).

Mapping of Course Outcomes with programme Outcomes

Course Code	POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B21CP0602	CO1	-	2	2	3	2	3	2	2	2	2
	CO2	-	2	2	3	2	3	2	2	2	2
	CO3	-	-	-	3	2	3	2	3	3	2
	CO4	-	-	-	3	2	3	2	3	3	2

CAREER DEVELOPMENT AND PLACEMENT

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

1. Willingness to learn
2. Self motivation
3. Teamwork
4. Communication skills and application of these skills to real scenarios
5. Requirement of gathering, design and analysis, development and testing skills
6. Analytical and Technical skills
7. Computer skills
8. Internet searching skills

9. Information consolidation and presentation skills
10. Role play
11. Group discussion, and so on

REVA University, therefore, has given utmost importance to develop these skills through variety of training programs and such other activities that induce the said skills among all students. A full-fledged Career Counseling and Placement division, namely Career Development Center (CDC) headed by well experienced senior Professor and Dean and supported by dynamic trainers, counselors and placement officers and other efficient supportive team does handle all aspects of Internships and placements for the students of REVA University. The prime objective of the CDC is to liaison between REVA graduating students and industries by providing a common platform where the prospective employer companies can identify suitable candidates for placement in their respective organization. The CDC organizes pre-placement training by professionals and also arranges expert talks to our students. It facilitates students to career guidance and improves 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 Physics, Chemistry, and Mathematics 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 University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director to facilitate skill related training to REVA students and other unemployed students around REVA campus. The center conducts variety of skill development programs to students to suite to their career opportunities. Through this skill development centre, the students shall compulsorily complete at least two skill / certification-based programs before the completion of their degree. The University has collaborations with Industries, Corporate training organizations, research institutions and Government agencies like NSDC (National Skill Development Corporation) to conduct certification programs. REVA University has been recognised as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal Vikas Yojana.

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