School of Applied Sciences B.Sc. PMSt

HANDBOOK 2018-2021

REVA UNIVERSITY
Bengaluru, India

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

School of Applied Sciences
B. Sc - (Physics, Mathematics and Statistics)

HANDBOOK

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Chancellor's Message

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

— Nelson Mandela.

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

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

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

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

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

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

Vice-Chancellor's Message

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

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

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

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

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

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

 Welcome to the portals of REVA University!

Dr. S. Y. Kulkarni

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 more number of teachers and professors to work in schools and colleges. Research has also been given equal importance. Private sector and Corporates are also looking for smart science graduates in a big way. The B.Sc. degree program of REVA University is designed to prepare Physicists, Mathematicians, scientists, teachers, professionals & administrators who are motivated, enthusiastic & creative thinkers to meet the challenges of growing economy as well as to fulfill the growing aspirations of the youth.

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

This handy document containing brief information about B.Sc. (PMSt) 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 teacher's involvement and guidance. We will strive to provide all needed comfort andcongenial 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 courses are integrated with cross cutting issues with relevant to professional ethics,gender,human values,environment and sustainability.

Dr. Beena G
Director

School of Applied Sciences

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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 11,000 students study various courses across REVA's three campuses equipped with exemplary state-of-the-art infrastructure and conducive environment for the knowledge driven community.

ABOUT REVA UNIVERSITY

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

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

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

The programs being offered by the REVA University are well planned and designed after detailed study with emphasis with knowledge assimilation, applications, global job market and their social relevance. Highly qualified, experienced faculty and scholars from reputed universities / institutions, experts from industries and business sectors have contributed in preparing the scheme of instruction and detailed curricula for this program. Greater emphasis on practice in respective areas and skill development to suit to respective job environment has been given while designing the curricula. The Choice Based Credit System and Continuous Assessment Graded Pattern (CBCS – CAGP) of education has been introduced in all programs to facilitate students to opt for subjects of their choice in addition to the core subjects of the study and prepare them with needed skills. The system also allows students to move forward under the fast track for those who have the capabilities to surpass others. These programs are taught by well experienced qualified faculty supported by the experts from industries, business sectors and such other organizations. REVA University has also initiated many supportive measures such as bridge courses,

special coaching, remedial classes, etc., for slow learners so as to give them the needed input and build in them confidence and courage to move forward and accomplish success in their career. The University has

also entered into MOUs with many industries, business firms and other institutions seeking their help in imparting quality education through practice, internship and also assisting students' placements.

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

The REVA University has also given utmost importance to develop the much required skills through variety of training programs, industrial practice, case studies and such other activities that induce the said skills among all students. A full-fledged Career Development and Placement (CDC) department with world class infrastructure, headed by a dynamic experienced Professor & Dean, and supported by well experienced Trainers, Counselors and Placement Officers. The University also has University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director facilitating skill related training to REVA students and other unemployed students. The University has been recognized as

a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal Vikas Yojana. The Centre conducts several add-on courses in challenging areas of development. It is always active in facilitating student's variety of Skill Development Training programs.

The University has collaborations with Industries, universities abroad, research institutions, corporate training organizations, and Government agencies such as Florida International University, Okalahoma State University, Western Connecticut University, University of Alabama, Huntsville, Oracle India Ltd, Texas Instruments, Nokia University Relations, EMC^2, VMware, SAP, Apollo etc, to facilitate student

exchange and teacher–scholar exchange programs and conduct training programs. These collaborations with foreignuniversities also facilitates students to study some of the programs partly in REVA University and partly in foreign university, viz, M.S in Computer Science one year in REVA University and the next year in the University of Alabama, Huntsville, USA.

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

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

As a part of our effort in motivating and inspiring youth of today, REVA University also has instituted awards and prizes to recognize the services of teachers, researchers, scientists, entrepreneurs, social workers and such others who have contributed richly for the development of the society and progress of

the country. One of such award instituted by REVA University is **'Life Time Achievement Award'** to be awarded to successful personalities who have made mark in their field of work. This award is presented on occasion of the **"Founders' Day Celebration"** of REVA University on 6th January of every year in presence of dignitaries, faculty members and students gathering. The first "REVA Life Time Achievement Award" for the year 2015 has been awarded to Shri. Kiran Kumar, Chairman ISRO, followed by Shri. Shekhar Gupta, renowned Journalist for the year 2016, Dr K J Yesudas, renowned play back singer for the year 2017. REVA also introduced "**REVA Award of Excellence"** in the year 2017 and the first Awardee of this prestigious award is Shri Ramesh Aravind, Actor, Producer, Director, Screen Writer and Speaker.

REVA organizes various cultural programs to promote culture, tradition, ethical and moral values to our students. During such cultural events the students are given opportunities to unfold their hidden talents and motivate them to contribute innovative ideas for the progress of the society. One of such cultural events is REVAMP conducted every year. The event not only gives opportunities to students of REVA but also

students of other Universities and Colleges. During three days of this mega event students participate in debates, Quizzes, Group discussion, Seminars, exhibitions and variety of cultural events. Another important event is Shubha Vidaaya, - Graduation Day for the final year students of all the programs, wherein, the outgoing students are felicitated and are addressed by eminent personalities to take their future career in a right spirit, to be the good citizens and dedicate themselves to serve the society and make a mark in their respective spheres of activities. During this occasion, the students who have achieved top ranks and wonmedals and prizes in academic, cultural and sports activities are also recognized by distributing awards and prizes. The founders have also instituted medals and prizes for sports achievers every year. The physical education department conducts regular yoga classes everyday to students, faculty members, administrative staff and their family members and organizes yoga camps for villagers around.

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

Vision

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

Misson

To create excellent infrastructure facilities and state-of-the-art laboratories and incubation centers

To provide student-centric learning environment through innovative pedagogy and education reforms

To encourage research and entrepreneurship through collaborations and extension activities

To promote industry-institute partnerships and share knowledge for innovation and development

To organize society development programs for knowledge enhancement in thrust areas

To enhance leadership qualities among the youth and enrich personality traits, promote patriotism and moral values.

Objectives

Creation, preservation and dissemination of knowledge and attainment of excellence in different disciplines

Smooth transition from teacher - centric focus to learner - centric processes and activities

Performing all the functions of interest to its major constituents like faculty, staff, students and the society to reach leadership position

Developing a sense of ethics in the University and Community, making it conscious of its obligations to the society and the nation

Accepting the challenges of globalization to offer high quality education and other services in a competitive manner

ABOUT SCHOOL OF APPLIED SCIENCES

The School of Applied Sciences offers graduate and post graduate programs in Biotechnology, Biochemistry, Chemistry, Physics and Mathematics which are incredibly fascinating. It aims to attract talented youth and train them to acquire knowledge and skills useful to industrial sectors, research laboratories, and educational institutions. The School presently offers B.Sc. degree programs in Bio-Chemistry, Bio-Technology, Chemistry, Physics, Mathematics and B Sc with various combinations viz, Biotechnology, Biochemistry and Genetics, Physics Chemistry and Mathematics, Mathematics , Physics and Statistics, Mathematics Statistics and Computer Science, and Bioinformatics, Biology Mathematics & Computer Science and also Post Graduate Diploma in Clinical Research Management, Post Graduate Diploma in Functional Geneomics & Bioinformatics. 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

BoS

Sl.No.	Name of the Member	Designation	Signature
1	**Dr. D V Sunitha** Associate Professor & Coordinator School of Physical Sciences (Physics) REVA University; 7760884884; sunithadv@reva.edu.in	**Chairman**	
2	**Dr. M Madesh Kumar** Associate Professor, Department of Physics REVA University madeshkumar@reva.edu.in; 9341271290	**Physics – Internal Member**	
3	**Prof. Chandrabhas Narayana** FRSC FNASc FASc Chairman and Professor Chemistry and Physics of Materials Unit Jawaharlal Nehru Centre for Advanced Scientific Research, Jakkur P.O., Bangalore 560064 Mob: +91 9448682721cbhas@jncasr.ac.in or cbhasi@gmail.com	**Physics – External Member**	
4	**Dr. Harish Babu G A** Professor and Coordinator, Department of Mathematics, REVA University,harishbabuga@reva.edu.in; 9845549977	**Mathematics – Internal Member**	
5	**Dr. Hanumagowda B N** Professor Department of Mathematics REVA University hanumagowdabn@reva.edu.in 9845871372	**Mathematics – Internal Member**	
6	**Dr. Vishu Kumar M** Professor Department of Mathematics REVA University vishukumarm@reva.edu.in 9845871372	**Mathematics – Internal Member**	
7	**Dr. Uday Kumar K M** Associate Professor, School of Physical Science - Department of Mathematics REVA University udayakumarkn@reva.edu.in 9980923283	**Mathematics – Internal Member**	
8	**Prof. Brinda Halmadi** Assistant Professor, Department of Mathematics REVA University brinda@revainstitution.org; 9844659900	**Mathematics – Internal Member**	
9	**Major. K Shivakumar** Associate Professor, GFGC Yelahanka Shiva1962@gmail.com; 9448809881	**Mathematics – External Member**	
10	**Ms. Mohankumari C** Assistant Professor, Department of Statistics, REVA University, mohankumaric@revainstitution.org 9741403154	**Statistics – Internal Member**	
11	**Mr. Shantappanavar S B** Assistant Professor, Department of Statistics, Maharani Science College, Mysore. shantappanavar@gmail.com; 9448294319	**Statistics – External Member**	
12	**Mr. K Narayan Gowda** Assistant Professor, Department of Statistics, REVA University, mohankumaric@revainstitution.org kngowda@gmail.com; 9844011027	**Statistics – Internal Member**	

B. Sc - Physics, Mathematics and Statistics (PMSt) Program

Programme Overview

Physics is a 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. Statistics is a branch of mathematics dealing with the collection, analysis, interpretation, presentation, and organization of data. Statistics especially useful when we cannot explain a phenomenon in a deterministic way. In the present world most of the scientific and business decision is made based on interpretation of historic data and thus statistics is gaining enormous importance. Since centuries, study of physics, mathematics and statistics in universities has become a practice because of the importance for understanding scientific and business issues.

The School of Applied Sciences at REVA UNIVERSITY has designed to offer B.Sc. in Physics, Mathematics and statistics as an undergraduate degree programme to create motivated, enthusiastic, thinking and creative graduates to fill the roles as teachers, statisticians, 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. (PMSt) programme designed will act as a foundation and first degree to prepare teachers, statisticians, 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. (PMSt) 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. St) course is to prepare graduates to

PEO-1	Demonstrate problem solving skills in mathematics, Physics and Statistics by communicating effectively either leading a team or as a team member.
PEO-2	Express oral and written interpersonal skills in order 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)

1. Demonstrate the knowledge in the areas of mathematics, Physics, and statistics.

2. Apply the fundamentals of mathematics, Physics, and statistics to formulate, solve and interpret complex problems.

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

4. Recognize the need to expertise in the areas of mathematics, Physics, and statistics by self up gradation through lifelong learning.

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

6. Exhibit professional and ethical responsibility.

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

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

Programme Specific Outcomes (PSO)

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

1. Acquire a strong conceptual foundation in the area of mathematics, Physics, and statistics using latest software tools and technologies, along with analytical and managerial skills to arrive at cost effective and optimum solutions.

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

REVA University Regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for UnderGraduate Degree Programs, 2019

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

1.   Title and Commencement:

1.1. These Regulations shall be called the **"REVA University Regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for Undergraduate Degree Programs, 2020".**

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

2.   The Programs:

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

B. Sc in:
     Physics, Mathematics and Statistics.

3.   Definitions:

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

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

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

T stands for **Tutorial** session consisting participatory discussion / 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 that equip students to acquire the much-required skill component.

4.   Courses of study and Credits

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

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

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

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

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

4.1.5. Different C**ourses of Study** are labeled and defined as follows:

a.   Core Course:

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

b.   Foundation Course (FC):

The foundation Course is a core course which should be completed successfully as a part of graduate degree program irrespective of the branch of study.

c.   Hard Core Course (HC):

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

d.   Soft Core Course (SC):

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

e.   Open Elective Course:**

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

5. Eligibility for Admission:

5.1. The eligibility criteria for admission to B. Sc (PMSt) Program of 3 years (6 Semesters) is given below:

Sl. No.	Program	Duration	Eligibility
1	Bachelor of Science	3 Years	Pass in PUC/10+2 examination with Physics and Mathematics as compulsory subjects along with at least one subject of any combination / Technical Vocational 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.

5.2 Provided further that the eligibility criteria are subject to revision by the Government Statutory Bodies, such as AICTE, UGC from time to time.

6. Scheme, Duration and Medium of Instructions:

6.1. B Sc degree program is of 6 semesters - 3 years duration. A candidate can avail a maximum of 16 semesters - 6 years as per double duration norm, in one stretch to complete B Sc degree, including blank semesters, if any. Whenever a candidate opts for blank semester, he/she has to study the prevailing courses offered by the School when he/she resumes his/her studies.

6.2. The medium of instruction shall be English.

7. Credits and Credit Distribution

7.1. A candidate has to earn 192 credits for successful completion of B Sc degree with the distribution of credits for different courses as given in **Table-1** below:

Course Type	Credits For B Sc Degree (6 Semesters)
Foundation Core Course	A minimum of 08
Hard Core Course	A minimum of 136, but not exceeding 156
Soft Core Course	A minimum of 24 but not exceeding 44
Open Elective	A minimum of 04
Total	**192**

7.2. Every course including project work, practical work, field work, self study elective should be entitled as **Foundation Course (FC), Hard Core (HC) or Soft Core (SC) or Open Elective (OE)** or **Core Course** (**CC**) by the BoS concerned. However, following shall be the **Foundation Courses** with credits mentioned against them, common to all branches of study.

Sl. No.	Course Title	Number of Credits
1	English for Technical Communication	4
2	Environmental Studies	2
3	Indian Constitution and Professional Ethics	2

7.3. A candidate can enrol for a maximum of 32 credits and a minimum of 20 credits per Semester. However, he / she may not successfully earn a maximum of 32 credits per semester. This maximum of 32 credits does not include the credits of courses carried forward by a candidate.

7.4. Only such full time candidates who register for a minimum prescribed number of credits in each semester from I semester to VIII semester and complete successfully 192 credits in 8 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. Assessment

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

c) Out of 50% weight earmarked for Internal Assessment (IA)- 10% is for Quizzes, 15% for test-1, 15% for test-2 and 10% for Assignments and this is applicable for theory-based courses

d) The quizzes, tests and assignments are conducted as per the semester academic calendar provided by the University

The details as given in the table

Component	Description	Conduction	Weight Percentage
C1	Quizzess	At the end of each class	10
C2	Test-1: IA1	6th week from the starting date of semester	15
	Test-2: IA2	12th week from the starting date of semester	15
C3	1 Assignment	7th week	05
	2 Assignment	13 th week	05
C4	SEE including practical	between 17th Week-20th Week	50
Results to be Announced			By the end of 21st Week

 Note: IA or CIA includes C1, C2, C3

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

e) *Students are required to complete courses like communication skills, technical English, Professional ethics and Indian Constitution, Environmental Sciences, technical skills, placement related courses, Open electives and any such value addition or specialized courses through online platforms like SWAYAM/NPTEL/Any other reputed online education aggregator. Students are required to choose the courses on the advice of their course coordinator/Director and required to submit the course completion certificate along with percentage of marks/grade scored in the assessment conducted by the online education aggregator. If the online education aggregator has issued a certificate along with the grade or marks scored to students, such courses will be considered for SGPA calculations, in*

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

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

9. Setting question paper and evaluation of answer scripts.

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

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

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

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

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

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

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10.   Evaluation of Practical's and Minor Project / Major Project / Dissertation

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

a) Knowledge of relevant processes.

b) Skills and operations involved;

c) Results / products including calculation and reporting.

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

   a)   Continuous Internal assessment (CIA) = 50 marks

   b)   Semester end practical examination (SEE) = 50 marks

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

i	Conduction of regular practical throughout the semester	20 marks
ii	Maintenance of lab records	10 marks
iii	Laboratory test and viva	20 marks
	Total	50 marks

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

i	Conduction of semester end practical examination	30 marks
ii	Write up about the experiment / practical conducted	10 marks
iii	Viva Voce	10 marks
	Total	50 marks

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

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

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

11. Provision for Appeal

If a candidate is not satisfied with the evaluation of C1, C2 and C3 components, he/she can approach the grievance cell with the written submission together with all facts, the assignments, test papers etc, which were evaluated. He/she can do so before the commencement of semester-end examination. The grievance cell is empowered to revise the marks if the case is genuine and is also empowered to levy penalty as prescribed by the university on the candidate if his/her submission is found to be baseless and unduly motivated. This cell may recommend taking disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the grievance cell is final.

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

- The Registrar (Evaluation) - Ex-officio Chairman / Convener

- One Senior Faculty Member (other than those concerned with the evaluation of the course concerned) drawn from the school / department/discipline and/or from the sister schools / departments/sister disciplines – Member.

- One Senior Faculty Members / Subject Experts drawn from outside the University school / department – Member.

12. Eligibility to Appear for Semester End Examination

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

12.2. Requirements to Pass a Course

Students are required to score a total minimum of 40% (Continuous Internal assessment and SEE) in each course offered by the University/ Department for a pass (other than online courses) with a minimum of 13 (25% of 50) marks in final examination

12.3. Requirements to Pass the Semester

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

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

13.1. The student who has failed in a maximum of 4 courses in odd and even semesters together shall move to next semester of immediate succeeding year of study. And he / she shall appear for C4 examination of failed courses of previous semesters concurrently with odd semester end examinations (C4) and / or even semester end examinations (C4) of current year of study. However, he / she shall have to clear all courses of both odd and even semesters of preceding year to register for next succeeding semester.

Examples:-

b. Student "A" has failed in 1 Course in First Semester and 3 Courses in Second Semester. He / she is eligible to seek admission for Third Semester and appear for C4 examination of 1 failed Course of First Semester concurrently with Third Semester C4 examination. Likewise, he / she is eligible to appear for C4 examination of 3 failed Courses of Second Semester concurrently with Fourth Semester C4 examination. However, he / she has to clear all the failed Courses of First and Second Semesters before seeking admission to Fifth Semester.

c. Student "B" has failed in 2 Courses in Third Semester and 2 Courses in Fourth Semester and has passed in all Courses of First and Second Semesters. He / she is eligible to seek admission to Fifth Semester and appear for C4 examination of 2 failed Courses of Third Semester concurrently with Fifth Semester C4 examination. Likewise, he / she is eligible to appear for C4 examination of 2 failed Courses of Fourth Semester concurrently with Sixth Semester C4 examination

d. Student "C" has failed in 4 Courses in Fifth Semester but has cleared all the courses in Sixth Semester. He / She has also passed all the courses of First to Fourth Semesters. Student "C" is eligible to seek admission for Seventh Semester and appear for C4 examination of 4 failed Courses of Fifth Semester concurrently with Seventh Semester C4 examination. However, he / she has to pass all the failed courses of Fifth Semester along with Sixth Semesters courses to earn B Sc Degree.

e. Student "D" passed in 1to 4 semesters but failed in 3 courses of 5th Semester and in 1 course of 6th Semester. He / She has also passed all the courses of First to Fourth Semesters. Student "D" is also eligible to seek admission for 5th Semester and appear for C4 examination of 3 failed courses of 5th Semester concurrently with 5th Semester C4 examination and one failed course of 5th Semester concurrently with 6th Semester C4 examination. However, he / she has to pass all the 3 failed courses of Fifth Semester courses to earn B Sc Degree.

13.1.   Re-Registration and Re-Admission:

a)   In case a candidate's class attendance in aggregate of all courses in a semester is less than 75% or

as stipulated by the University, such a candidate is considered as dropped the semester and is not allowed to appear for end semester examination (C4) and he / she shall have to seek re-admission to that semester during subsequent semester / year within a stipulated period.

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

14.   Attendance Requirement:

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

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 (C4) examination and such student shall seek re-admission as provided in 7.8.4.

14.4.   Teachers offering the courses will place the above details in the School Board meeting during the last week of the semester, before the commencement of C4, and subsequently a notification pertaining to the above will be brought out by the Director of the School before the commencement of C4 examination. A copy of this notification shall also be sent to the office of the Registrar & Registrar (Evaluation).

15.   Absence during Mid Semester Examination:

In case a student has been absent from a mid semester (C1,C2 and C3) examination due to the illness or other contingencies he / she may give a request along with necessary supporting documents and certification from the concerned class teacher / authorized personnel to the concerned Head of the School, for make-up examination. The Head of the School may consider such request depending on the merit of the case and after consultation with course instructor and class teacher and arrange to conduct a special test for such candidate(s) well in advance before the C4 examination of that respective semester. Under no circumstances C1, C2& C3 test shall be held after C4 examination.

16.   Grade Card and Grade Point

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

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

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

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

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

Here, P is the percentage of marks (P=[C1+C2+C3+C4] secured by a candidate in a course which is **rounded to nearest integer**. V is the credit value of course. G is the grade and GP is the grade point.

16.3.1. Computation of SGPA and CGPA

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

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

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

Illustration for Computation of SGPA and CGPA

Illustration No. 1

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

Thus, **SGPA = 188 ÷ 24 = 7.83**

Illustration No. 2

Course	Credit	Grade letter	Grade Point	Credit Point (Credit x Grade point)
Course 1	4	A	8	4X8=32
Course 2	4	B+	7	4X7=28
Course 3	3	A+	9	3X9=27
Course 4	3	B+	7	3X7=21
Course 5	3	B	6	3X6=18
Course 6	3	P	5	3X5=15
Course 7	2	B+	7	2X7=21
Course 8	2	O	10	2X10=20
	24			175

Thus, **SGPA = 175 ÷ 24 = 7.29**

Illustration No.3

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

	24			199

Thus**, SGPA = 199 ÷ 24 = 8.29**

16.4. Cumulative Grade Point Average (CGPA):

16.4.1. Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of the required number of credits (192) for B. Sc degree is 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.

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

Illustration:
CGPA after Final Semester

Semester (ith)	No. of Credits (Ci)	SGPA (Si)	Credits x SGPA (Ci X Si)
1	24	6.83	24 x 6.83 = 163.92
2	24	7.29	24 x 7.29 = 174.96
3	24	8.11	24 x 8.11 = 192.64
4	26	7.40	26 x 7.40 = 192.4
5	26	8.29	26 x 8.29 = 215.54
6	24	8.58	24 x 8.58 = 205.92
7	24	9.12	24 x 9.12 = 218.88
8	24	9.25	24 x 9.25 =222
Cumulative	196		1588.26

Thus, **CGPA** = $\frac{24x6.83+24x7.29+24x8.11+26x7.40+26x8.29+24x8.58+24x9.12+24x9.25}{196}$ = 8.10

16.4.2.   CONVERSION OF GRADES INTO PERCENTAGE:

Conversion formula for the conversion of CGPA into Percentage is:

Percentage of marks scored = CGPA Earned x 10 (to be discussed)

its normally CGPA x 9.5

Illustration: CGPA Earned 8.10 x 10=81.0

16.5.   Classification of Results

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

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

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Overall percentage=10*CGPA

17. Challenge Valuation:

a.   A student who desires to apply for challenge valuation shall obtain a photo copy of the answer script by paying the prescribed fee within 10 days after the announcement of the results. He / She can challenge the grade awarded to him/her by surrendering the grade card and by submitting an application along with the prescribed fee to the Registrar (Evaluation) within 10 days after the announcement of the results. This challenge valuation is only for C3 component.

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

18. With regard to any specific case of ambiguity and unsolved problem, the decision of the Vice-Chancellorshall be final.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS1030	CO1	3	3	2	1	1				3	2
	CO2	3	3	2	1					3	2
	CO3	3	2	2	1	1				3	3
	CO4	3	2	1	1					3	2
Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS1040	CO1	3	2	2						3	2
	CO2	3	2	2						3	2
	CO3	3	2	2						3	3
	CO4	3	2	1	1					3	2
Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS1050	CO1	2	3	2	2	1	2	1	1	3	2
	CO2	2	3	2	3	1	2	1	1	2	3
	CO3	3	3	2	3	1	2	1	1	2	2
	CO4	2	2	2	3	2	2	1	1	2	2
Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS1060	CO1						1				
	CO2						1				
	CO3						1				
	CO4						1				
Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS2030	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	PS01	PS02
B18PS2040	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	PS01	PS02
B18PS2050	CO1	2	3	2	3	1	2	1	1	3	2
	CO2	3	3	2	3	1	2	1	1	3	3
	CO3	2	3	2	2	1	2	1	1	3	3

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
	CO4	2	3	2	3	1	2	1	1	3	2
Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS2060	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	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS3030	CO1	3	3	3	3	1				3	3
	CO2	3	3	3	3					3	3
	CO3	3	2	2	2	1				3	2
	CO4	3	3	2	2					3	2
Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS3040	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	PS01	PS02
B18PS3050	CO1	2	2	2	2	1	1	1	1	2	2
	CO2	2	3	3	3	1	2	1	1	3	3
	CO3	2	3	3	2	1	2	1	1	3	2
	CO4	2	2	2	2	1	1	1	1	2	2
Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS3061	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	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS4030	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	PS01	PS02

	CO1	3	3	3	3			1	3	3	3
	CO2	3	2	1	2			1	2	3	3
B18PS4040	CO3	3	2	2	2			1	2	3	3
	CO4	3	3	3	3			1	3	3	3
	CO5	3	3	3	3			1	3	3	3

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS4050	CO1	2	3	2	2	1	2	1	1	3	2
	CO2	2	2	2	2	1	2	1	1	2	2
	CO3	2	3	2	2	1	2	1	1	2	2
	CO4	2	3	2	2	1	2	1	1	3	2

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS5010	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	PS01	PS02
B18PS5020	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	PS01	PS02
B18PS5030	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	PS01	PS02
B18PS5040	CO1	2	3	3	3	2	2	2	1	3	3
	CO2	2	3	2	3	1	2	2	1	3	2
	CO3	2	3	2	3	1	2	1	1	3	3
	CO4	2	3	2	3	1	2	1	1	2	3

Course Code	POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS5050	CO1	2	3	3	3	1	2		3		
	CO2	2	3	3	3	1	2		3		
	CO3	2	3	3	3	1	2		3		

	CO4	2	3	3	3	2	2		4		
Course Code	**POS / COS**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS6010	CO1	3	3	2	2	1				3	3
	CO2	3	3	2	1	1				3	3
	CO3	3	3	2	1	1				3	2
	CO4	3	2	2		1				3	2
Course Code	**POS / COS**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS6020	CO1	3	2	2	1					3	3
	CO2	3	2	2	1					3	3
	CO3	2	2	2	1	1				3	3
	CO4	3	2	2	1	1				3	3
Course Code	**POS / COS**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PS01	PS02
B18PS6030	CO1	3	3	3	2			1	2	3	
	CO2	3	2	2	3			1	2	2	2
	CO3	2	3	3	3			1	3	1	3
	CO4	3	3	2	3			1	3	2	3

Mapping of PEOS with Respect to POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	
PEO1	√	√	√	√	√	√	√	√	√	√	
PEO2	√	√	√	√	√	√	√	√	√	√	
PEO3	√	√	√	√	√	√	√	√	√	√	
PEO4	√	√	√	√	√	√	√	√	√	√	

B. Sc – Physics, Mathematics & Statistics (PMSt)

Program

Scheme Instruction and Detailed Syllabus

(Effective from the Academic Year 2018-20)

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

Sl No	Course Code	Title of the Course	HC/ SC/ SE/ CC	L	T	P	Total	Hours
					Credit Pattern			
FIRST SEMESTER								
1	B18PS1011	Language – II: Kannada	CC					
2	B18PS1012	Language – II: Hindi	CC	2	1	0	3	4
3	B18PS1013	Language – II: Additional English	CC					
4	B18PS1020	Functional English - I	CC	2	1	0	3	4
5	B18PS1030	Mechanics and Fluid Dynamics	HC	2	1	0	3	4
6	B18PS1040	Mathematics - I	HC	2	1	0	3	4
7	B18PS1050	Basic Statistics - I	HC	2	1	0	3	4
8	B18PS1060	Constitution of India / Professional Ethics	FC	2	0	0	2	2
		Practicals						
9	B18PS1070	Physics Lab-I	HC	0	0	2	2	3
10	B18PS1080	Mathematics Lab - I	HC	0	0	2	2	3
11	B18PS1090	Basic Statistics Lab - I	HC	0	0	2	2	3
		Total Credits		**12**	**5**	**6**	**23**	**31**
SECOND SEMESTER								
1	B18PS2011	Language – II: Kannada	CC					
2	B18PS2012	Language – II: Hindi	CC	2	1	0	3	4
3	B18PS2013	Language – II:Additional English	CC					
4	B18PS2020	Functional English - II	CC	2	1	0	3	4
5	B18PS2030	Heat and Thermodynamics	HC	2	1	0	3	4
6	B18PS2040	Mathematics - II	HC	2	1	0	3	4
7	B18PS2050	Basic Statistics - II	HC	2	1	0	3	4
8	B18PS2060	Environmental Studies	FC	2	0	0	2	2
9	B18PS2070	Sports/Yoga/music/dance/theatr	RULO	2	0	0	2	2
		Practicals						
10	B18PS2080	Physics Lab-II	HC	0	0	2	2	3
11	B18PS2090	Mathematics Lab - II	HC	0	0	2	2	3
12	B18PS2X10	Basic Statistics Lab - II	HC	0	0	2	2	3

	Total Credits				**14**	**5**	**6**	**25**	**33**

THIRD SEMESTER								
1	B18PS3011	Language – II: Kannada	CC					
2	B18PS3012	Language – II: Hindi	CC	2	1	0	3	4
3	B18PS3013	Language – II: Additional English	CC					
4	B18PS3020	Communicative English - I	CC	2	1	0	3	4
5	B18PS3030	Waves and optics	HC	2	1	0	3	4
6	B18PS3040	Mathematics-III	HC	2	1	0	3	4
7	B18PS3050	Statistical Interence - I	HC	2	1	0	3	4
8	B18PS3061	Physics in Everyday life	OE					
9	B18PS3062	Classical Optimization	OE	4	0	0	4	4
		Practicals						
10	B18PS3070	Physics Lab -III	HC	0	0	2	2	3
11	B18PS3080	Mathematics Lab - III	HC	0	0	2	2	3
13	B18PS3X20	Statistical Interence lab - I	HC	0	0	2	2	3
		Total Credits		**16**	**4**	**6**	**26**	**33**
FOURTH SEMESTER								
1	B18PS4011	Language – II: Kannada	CC					
2	B18PS4012	Language – II: Hindi	CC	2	1	0	3	4
3	B18PS4013	Language – II: Additional English	CC					
4	B18PS4020	Communicative English - II	CC	2	1	0	3	4
5	B18PS4030	Electricity and Magnetism	HC	2	1	0	3	4
6	B18PS4040	Mathematics - IV	HC	2	1	0	3	4
7	B18PS4050	Statistical Interence - II	HC	2	1	0	3	4
8	B18PS4060	Soft Skill Training	RULO	1	1	0	2	3
		Practicals						
9	B18PS4070	Physics Lab -IV	HC	0	0	2	2	3
10	B18PS4080	Mathematics Lab - IV	HC	0	0	2	2	3
11	B18PS4090	Statistical Interence Lab - II	HC	0	0	2	2	3
		Total Credits		**11**	**6**	**6**	**23**	**32**
FIFTH SEMESTER								
1	B18PS5010	Quantum Mechanics	HC	1	1	0	2	3
2	B18PS5020	Mathematics - V	HC	1	1	0	2	3
3	B18PS5030	Mathematics - VI	HC	1	1	0	2	3
4	B18PS5040	Design and Analysis of Experiments	HC	1	1	0	2	3
5	B18PS5050	Sampling Theory	HC	1	1	0	2	3

	B18PS5061	Renewable Energy Resource	SC	2	0	0	2	2
	B18PS5062	Solid State Physics						
	B18PS5063	Semiconductor Physics						
7	B18PS5071	Complex Analysis	SC	2	0	0	2	2
	B18PS5072	Fluid Dynamics						
	B18PS5073	Number Theory						
8	B18PS5081	Statistical Quallity Control	SC	2	0	0	2	2
	B18PS5082	Reliability and survival Analysis						
	B18PS5083	Data Mining						
9	B18PS5090	Soft Skill Training	RULO	1	1	0	2	3
		Practicals						
10	B18PS5X10	Physics Lab – V	HC	0	0	2	2	3
11	B18PS5X20	Physics Lab –VI	HC	0	0	2	2	3
12	B18PS5X30	Design and Analysis of Experiments Lab	HC	0	0	2	2	3
		Total Credits		**12**	**6**	**10**	**28**	**39**

SIXTH SEMESTER

1	B18PS6010	Nuclear Physics -	HC	1	1	0	2	3
2	B18PS6020	Numerical Methods	HC	1	1	0	2	3
3	B18PS6030	Operations Research	HC	1	1	0	2	3
4	B18PS6041	Physics of Clouds	SC	2	0	0	2	2
	B18PS6042	Astro Physics						
	B18PS6043	Digital Electronics and Communication						
5	B18PS6051	Fuzzy Mathematics	SC	2	0	0	2	2
	B18PS6052	Topology						
	B18PS6053	Discrete Mathematics and Graph Theory						
6	B18PS6061	Applied Statistics	SC	2	0	0	2	2
	B18PS6062	Econometrics						
	B18PS6063	Actuarial Statistics						
7	B18PS6070	MOOC/SWAYAM/Internship	RULO	0	0	2	2	3
8	B18PS6080	Soft Skill Training	RULO	1	1	0	2	3
		Practicals						
9	B18PS6090	Physics Lab – VII	HC	0	0	2	2	3
10	B18PS6X10	Mathematics Lab - V	HC	0	0	2	2	3
11	B18PS6X20	Numerical Methods - Lab	HC	0	0	2	2	3

12	B18PS6X30	Operations Research Lab	HC	0	0	2	2	3
		Total Credits		**10**	**4**	**12**	**26**	**36**
		Total Credits of all Semesters					**144**	**195**

Distribution of credits – L: T: P

Sem	L	T	P	Total
I	12	05	06	23
II	14	05	06	25
III	16	04	06	26
IV	11	06	06	23
V	12	10	10	32
VI	10	04	12	26
Total	**75**	**34**	**46**	**155**

B18PS1011	Language-II: Kannada	L	T	P	C
Duration:14 Wks		**2**	**1**	**0**	**3**

Prerequisites:

- ಕನ್ನಡ ಭಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಅಗತ್ಯ.
- ಭಾಷೆಯನ್ನು ಓದಲುವ ಎತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು.
- ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು.

Course Objectives:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸರ್ವಾಂಗ್ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ವೇದಲನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಜನಪದ, ಪ್ರಾಚೀನ, ವಧರ್‌ಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯವನ್ನು ಪರ್ಯವ್ನಾಗಿ ಆಯ್ಕೆ ವ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ವುಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯು ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

1. ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಇತಿಹಾಸ ವ ಎತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ಅಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
2. ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋ ಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ವ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ವ ಮೂಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯ ಮಾಡಿದೆ.
3. ಅವರಲ್ಲಿ ಸೃಜನ ಶೀಲತೆ, ಶುದ್ಧ ಭಾಷೆ, ಉತ್ತಮ ವಿವೇಚನಾ ಗುಣ, ನಿರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶ ಎರಿಯ ಹಾಗಿದೆ.
4. ಸ್ಪಧರ್‌ಾತ್ಮಕ ಪರೀಕ್ಷೆ ಗಳಿಗೆ ಅನೇಕ ಶಾಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸಶಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ವ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

Course Outcomes:

ಜನಪದ, ಪ್ರಾಚೀನ, ವಧರ್‌ಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸ ಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯು ವ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

1. ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಹಾಗೂ ಲಿಂಗ ಸಂಬಂಧಿ ವಿಚಾರಗಳಿಗೆ ಗವನಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ವೆನೆ ಊಭಸಾವವ್ರಬೆ ಳಿ ಯ ಯತ್ತದೆ.
2. ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧ ಗಳು, ಸಮಸ್ಯೆಗಳನ್ನ ಆಧ್ಯ ನಿಕ ಸಂದಭರ್ಗದಲ್ಲಿ ವಿವಾನೀಯ ತೆ ಯ ಒಂದಿಗೆ ನಿವರ್ಹಿಸುವ ಒತೆ ಪ್ರೂರೆ ಈಪಿಸ ಒತ್ತ ದೆ.
3. ಸಾಮಾಜಿಕ ಅರಿವ ್ರುವ ಮೂಡಿಸ ಒತ್ತ ದೆ
4. ಉತ್ತ ವ ್ರ ಸ ಂವ ಹ ನ ಕ ಲೆ ಯ ನ್ನ ಬೆ ಳಿ ಸ ುವ ಉದ್ದ ೇಶ ವ ನ ್ನ ಈಡೆ ೕರಿಸ ಒತ್ತ ದೆ.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B181011	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		

Course Contents:

Unit-I: **12 Hrs**

1. ಸತ್ಯವಂತೆ ಹಡೆದವ್ವ – ಜನಪದ ಗೀತೆ
2. ನೆಲಸುಗೆ ನಿನ್ನ ವಕ್ಷದೊಳೆ – ಪಂಪ
3. ಕುಡು ಚಪಳೆ ಜಪದ ಮಣಿಯಂ – ನಾಗವರ್ಮ
4. ಚಿತ್ರ ಮಪಾತ್ರೆ ರಮತೆ ನಾರಿ – ಜನ್ನ

Unit-II: **12 Hrs**

1. ಅಬ್ದಿಯುಮೊರ್ಮೆ ಕಾಲವಶದಿಂ ಮರ್ಯಾದೆಯಂ ದಾಂಟದೇ.... – ನಾಗಚಂದ್ರ
2. ವಚನಗಳು – ಅಕ್ಕಮಹಾದೇವಿ
3. ವಚನಗಳು – ಬಸವಣ್ಣ
4. ಗುಂಡಯ್ಯನ ರಗಳೆ – ಹರಿಹರ

Unit-III: **12 Hrs**

1. ದುಷ್ಟಬುದ್ಧಿಯುಂ ಧರ್ಮಬುದ್ಧಿಯುಂ – ದುರ್ಗಸಿಂಹ
2. ಕಲ್ಯಾಡಿಯ ಕೋಣ – ಮಾಸ್ತಿ
3. ಯಾರೂ ಅರಿಯದ ವೀರ – ಕುವೆಂಪು
4. ಸಮಸ್ಯೆಯ ಮಗು – ತ್ರಿ ವೇಣಿ

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Unit-IV: **12 Hrs**

1. ಟೊಳ್ಳುಗಟ್ಟಿ – ಟಿ.ಪಿ. ಕೈಲಾಸಂ

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು:

1. ಮುಗಳಿ ರಂ.ಶ್ರೀ ೕ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ , ಪ್ರ ಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014

2. ಸಂಗ್ರ ಹ. ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಚಾರಿತ್ರಿ ಕ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರ ಕಾಶಕರು 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. ಸಂಗ್ರ ಹ. ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಕನ್ನಡ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರ ಕಾಶಕರು ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2007

5. ಹಂಪ ನಾಗರಾಜಯ್ಯ, ಸಾಂಗತ್ಯ ಕವಿಗಳು, ಪ್ರ ಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010

6. ನಾರಾಯಣ ಪಿ.ವಿ, ಚಂಪೂ ಕವಿಗಳು, ಪ್ರ ಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010

7. ಕಾಳೇಗೌಡ ನಾಗವಾರ, ತ್ರಿ ಪದಿ, ರಗಳೆ ಮತ್ತು ಜಾನಪದ ಸಾಹಿತ್ಯ, ಪ್ರ ಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010

8. ಸಂ. ಬೆನಗಲ್ ರಾಮ ರಾವ್ ಮತ್ತು ಪಾನ್ಯಂ ಸುಂದರ ಶಾಸ್ತ್ರೀ, ಪುರಾಣ ನಾಮ ಚೂಡಾಮಣಿ, ಪ್ರ ಕಾಶಕರು ಪ್ರ ಸಾರಾಂಗ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ. 2010

9. ಡಾ. ಚಿದಾನಂದ ಮೂರ್ತಿ, ವಚನ ಸಾಹಿತ್ಯ, ಪ್ರ ಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

10. ಸಂ. ಬಸವರಾಜು ಎಲ್. ಸರ್ವಜ್ಞನ ವಚನಗಳು, ಪ್ರ ಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2012

11. ಸಂ. ಬಸವರಾಜು ಎಲ್. ಅಕ್ಕನ ವಚನಗಳು, ಪ್ರ ಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 1997

12. ಸಂ ಮರುಳಸಿದ್ದಪ್ಪ ಕೆ, ನಾಗರಾಜ ಕಿ.ರಂ. ವಚನ ಕಮ್ಮಟ, ಪ್ರ ಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016

13. ನರಸಿಂಹಾಚಾರ್. ಡಿ.ಎಲ್., ಪಂಪ ಭಾರತ ದೀಪಿಕೆ, ಪ್ರ ಕಾಶಕರು ಡಿ.ವಿ.ಕೆ ಮೂರ್ತಿ ಪ್ರ ಕಾಶನ, ಮೈಸೂರು. 2012

14. ರಂಜಾನ್ ದರ್ಗಾ, ಶರಣರ ಸಮಗ್ರ ಕ್ರಾ ಂತಿ, ಪ್ರ ಕಾಶಕರು. ಲೋಹಿಯಾ ಪ್ರ ಕಾಶನ, ಬಳ್ಳಾರಿ. 2015

15. ದೇಶಪಾಂಡೆ ಎಸ್.ಎಲ್. ಬೇಂದ್ರೆ ಶರೀಫರ ಕಾವ್ಯಾಯಾನ, ಪ್ರ ಕಾಶಕರು ದೇಸಿ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2013

16. ಸಂ. ಬಿ.ಎಸ್. ಕೇಶವರಾವ್. ಕೈಲಾಸಂ ಕನ್ನಡ ನಾಟಕಗಳು, ಪ್ರ ಕಾಶಕರು ಅಂಕಿತ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2005

17. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ , ಪ್ರ ಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರ ಂಥಮಾಲೆ, ಮೈಸೂರು –2014ಶಿವರುದ್ರ ಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರ ಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್

B18PS1012		L	T	P	C
Duration:14 Wks	**Hindi - II**	**2**	**1**	**0**	**3**
ಹೌಸ್, ಬೆಂಗಳೂರು. 2013					

Prerequisites:

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

Course Objectives:

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

Course Outcomes:

अधिगम परिणाम :

अध्ययन की समाप्ति पर अध्येयता –

- सामाजिक मूल्य एवं नैतिक जवाबदेही को स्वीकार कर सकता है |
- साहित्य की प्रासंगिकता को जीवन में समझने की दक्षता रखता है |
- समाज में अंतर्निहित पद्धतियाँ एवं विचारधाराओं का व्याख्यान करने में सक्षम बन सकता है |

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS1012	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			

Course Contents:

अध्ययन विषय सूची / पाठ्यक्रम

इकाई – 1: कहानी, संस्मरण   अध्यापन अवधियाँ : 12 hrs.

1.कहानी – नशा – प्रेमचंद

2.कहानी – सुखमय जीवन – चंद्रधर शर्मा गुलेरी

3.संस्मरण – शरत के साथ बिताया कुछ समय – अमृतलाल नागर

इकाई – 2: कहानी, आत्मकथा   अध्यापन अवधियाँ : 12 hrs.

4.कहानी – मरने से पहले – भीष्म साहनी

5.कहानी – लाल हवेली – शिवानी

6.आत्मकथा – जेल- जीवन की झलक – गणेश शंकर विद्यार्थी

इकाई – 3: कहानी, व्यंग्य रचना   अध्यापन अवधियाँ : 12 hrs.

7.कहानी – चाय का एक प्याला – कैथरीन मैन्सफील्ड

8.व्यंग्य रचना – भेड़े और भेडियें – हरिशंकर परसाई

इकाई – 4: अनुवाद, संक्षेपण   अध्यापन अवधियाँ : 12 hrs.

अनुवाद : अंग्रेज़ी – हिन्दी (शब्द एवं अनुच्छेद)

संक्षेपण : परिच्छेद का एक तिहाई भाग में |

सन्दर्भ ग्रन्थ :

- पाठ्य पुस्तक – रेवा विश्वविद्यालय
- सुबोध व्यवहारिक हिन्दी – डॉ. कुलदीप गुप्त
- अभिनव व्यवहारिक हिन्दी – डॉ.परमानन्द गुप्त
- हिन्दी साहित्य का इतिहास - डॉ. नागेन्द्र
- आधुनिक हिन्दी साहित्य का इतिहास - डॉ. बच्चन सिंह
- हिन्दी साहित्य का नवीन इतिहास - डॉ. लाल साहब सिंह
- शुद्ध हिन्दी कैसे बोले कैसे लिखे- पृथ्वीनाथ पाण्डे
- कार्यालय अनुवाद निदेशिका
- संक्षेपण और पल्लवन - के.सी.भाटिया&तुमन सिंग

सूचना : पाठ ३. प्रणाम और ६. निराला : एक आकर्षित व्यक्तित्व के स्थान पर ३. शरत के साथ बिताया हुआ कुछ समय और ६. जेल जीवन की झलक पाठ को चयन करके, पाठ्यक्रम में संशोधन किया गया है |

B18PS1013	Additional English - II	L	T	P	C
Duration:14 Wks		**2**	**1**	**0**	**3**

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

Course Objectives:

1. To equip students with the ability to acquire the functional use of language in context.
2. To enable the students to explore and critique issues related to society and Ethics.
3. To develop in the students a genuine habit of reading and writing leading to
    effective and efficient communication.

Course Outcomes:

values.
2. Develop an understanding of literature in context.
3. Interpret and paraphrase their ideas logically and cohesively.
4. Illustrate the systems and ideologies inherent in the society.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS1013	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

Course Contents:

UNIT-I: Values and Ethics   **12 Hrs**

Literature: Rabindranath Tagore - Where the Mind is Without Fear, William Wordsworth – Three Years She Grew in Sun and Shower, Saki – The Lumber-room, William Shakespeare – Extract from *Julius Caesar* (Mark Antony's Speech) Language: Vocabulary Building.

UNIT-II: Natural & Supernatural   **12 Hrs**

Literature: John Keats – La Belle Dame Sans MerciCharles Dickens – The Signal Man

Hans Christian Anderson - The Fir TreeWilliam Shakespeare – An Excerpt from *The Tempest*

Language: Collective Nouns

UNIT-III: Travel and Adventure 12 Hrs

Literature: R.L. Stevenson – Travel, Elizabeth Bishop - The Question of Travel, H.G. Wells – The Magic Shop, Jonathan Swift – Excerpt from *Gulliver's Travels Book – I*

Writing Skills: Travelogue

UNIT-IV: Success Stories 12 Hrs

Literature: Emily Dickinson – Success is Counted SweetestRupert Brooke – Success

Dr. Martin Luther King - I Have a DreamHelen 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

B18PS1020	Functional English - I	L	T	P	C
Duration :14 Wks		2	1	0	3

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

Course Objectives:

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

Course Outcomes:

1. Interpret audio files and comprehend different spoken discourses / excerpts in different accents (Listening Skills).
2. Demonstrate speaking ability with clarity, confidence and comprehension and communicate with one or many listeners using appropriate communicative strategies (Speaking Skills).
3. Make use of reading different genres of texts adopting various reading strategies (Reading Skills).
4. Develop the ability to write cohesively, coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic (Writing Skills).

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS1020	CO1					3	3	3	1		
	CO2					3	3	3	2		
	CO3					3	3	3	2		
	CO4					3	3	3	1		

Course Content:

UNIT-I: Functional English 12 Hrs

Grammar: Prepositions; Modal Auxiliaries, listening: Listening to audio (verbal & sounds)

Speaking: Debating Skills, Reading: Skimming a reading passage; Scanning for specific information, Writing: Email communication

UNIT-II: Interpersonal Skills 12 Hrs

Grammar: Tenses; Wh-questions, Listening& Speaking: Listening and responding to video lectures / talks, Reading: Reading Comprehension; Critical Reading; Finding key information in a given text, Writing: Process descriptions (general/specific); Recommendations

UNIT-III: Multi tasking Skills 12 Hrs

Grammar: Conditional Sentences, Listening & Speaking: Listening to specific task; focused audio tracks and responding, Reading: Reading and interpreting visual material, Writing: Channel conversion (flowchart into process); Types of paragraph (cause and effect / compare and contrast / narrative / analytical); Note Taking/ Note Making

UNIT-IV: Communicative Skills 12 Hrs

Grammar: Direct and indirect speech, Listening & Speaking: Watching videos / documentaries and responding to questions based on them; Role plays, Reading: Making inference from the reading passage; predicting the content of a reading passage, Writing: Interpreting visual materials (line graphs, pie charts etc.); Different types of Essay Writing

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.

B18PS1030	Mechanics and Fluid Dynamics	L	T	P	C
Duration :14 Wks		2	0	1	3

To introduce operators, simple coordinate systems and its relevance to particles, rigid bodies and extending to strings and bars. Introductory

Course Objectives:

1. Equip with the basics of physics to solve problems involving Forces, Moments, Centroids and Moment of inertia
2. Impart knowledge about the relationship between the motion of bodies and moment of inertia
3. Familiarise with the principles of Kinematics and Hydrodynamics for practical applications.
4. Impart knowledge about fundamental laws of fluid mechanics and the Bernoulli's principle of practical   applications for flow rate measurements.

Course Outcomes:

On successful completion of this course; the student will be able to:
1. Apply Newton's laws of motion to as certain the state of the systems.
2. Compute the elastic properties of the materials.
3. Apply the concepts of conservation of energy and momentum to elastic and inelastic Collisions.
4. Summarise the concepts of surface tension and viscosity.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS1030	CO1	3	3	2	1	1				3	2
	CO2	3	3	2	1					3	2
	CO3	3	2	2	1	1				3	3
	CO4	3	2	1	1					3	2

Course Contents:

UNIT-I 12 Hrs

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, centripetal force and its derivation using vector notation, problems.

Frames of reference: Inertial reference frames with examples and uniform rectilinear motion in an inertial frame, Special theory of relativity. The Galilean principle of relativity, Galilean transformation equation. Non-inertial reference frame- illustration of an earth as non–inertial frame, concept of weightlessness by freely falling Lift. Qualitative discussion on centrifugal force, Coriolis force.

UNIT-II 12 Hrs

Conservation Laws: Basic symmetries of nature, 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), Multi stage rocket, Elastic and inelastic collisions, Elastic Head on collision, Elastic oblique collision in lab frame, reduced mass, 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.

UNIT-III 12 Hrs

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

Fluid Dynamics: Streamline and Turbulent Flow 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.

Surface Tension: surface tension-expression for pressure inside curved liquid surface. The drop-weight method, Angle of contact - Quincke's method –Theory.

UNIT-IV   **12 Hrs**

Rigid body Dynamics: Moment of Inertia of a body; Theorem of Moment of Inertia-Parallel and perpendicular axes theorem with proofs (2-D case); Calculation of moment of inertia of a disc, annular ring, solid sphere and rectangular bar; Conservation of angular momentum with illustrations.

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

Text Books:

1. B.Sc Physics Vol.1, Telugu Academy, Hyderabad
2. Mechanics & Properties of Matter, J.C. Upadhyaya, Himalaya Publishing House, Mumbai, 2015.
3. Physics Vol.1, Mechanics, Waves & Oscillations, S.L. Gupta and Sanjeev Gupta, Jai Prakash Nath& Co., Meerut

Reference Books:

1. J C . Upadhyay. Classical Mechanics, 11th edition, 2014
2. David Halliday. Robert Resnick, and Jearl Walker, Fundamentals of Physics, Sixth Edition, John Wiley & Sons, Inc.
3. Berkeley. Physics -Vol. 1, 2nd edition
4. D.C. Mathur. Mechanics, 5th edition 2016
5. Brijlal & Subramanyam. Properties of Matter, S Chand and Co., New Delhi

B18PS1030	Mathematics-I	L	T	P	C
Duration:14 Wks		**2**	**1**	**0**	**3**

Prerequisites:

Definition and types of matrices, differentiation and integration formulas and knowledge about differential equation, order and degree.

Course Objectives:

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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. Provide the fundamental concepts of differential equations and apply multiple approaches/appropriate techniques to solve first order ODEs.

Course Outcomes:

1. Apply the matrix theory to solve the system of linear equations.
2. Demonstrate the knowledge of successive differentiation to solve the problems relative with standard formulae and Leibnitz theorem to find n^{th} differentiation of functions.
3. Gain the Knowledge of reduction formulae and differentiation under integral sign by Leibnitz rule to solve integral equations.
4. Utilize the concepts of order, degree and linearity of ODE and recognize ODEs.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS1030	CO1	3	2	2						3	2
	CO2	3	2	2						3	2
	CO3	3	2	2						3	3
	CO4	3	2	1	1					3	2

Course Contents:

Unit-I: Theory of Matrices   **12 Hrs**

Elementary row and column transformations (operations), equivalent matrices, theorems on it. Row - reduced echelon form, Normal form of a matrix, Rank of a matrix, Problems. Homogeneous and Non – Homogeneous systems of '*m*' linear equations in '*n*' unknown's consistency criterion – criterion for uniqueness of solutions. Solution of the same by elimination method. Eigenvalues and Eigenvectors of a square matrix of order 2 and 3, standard properties, Cayley-Hamilton theorem (with proof). Finding A^{-1}, A^{-2} & A^2, A^3, A^4. Solving the linear Equations with Three Unknowns.

Unit-II: Differential Calculus – 1   **12 Hrs**

Successive differentiations, n^{th} differentiation 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's theorem (**with proof**) and its application (problems).

Unit-III: Integral Calculus - 1   **12 Hrs**

Reduction formula for

$$\int \sin^n xdx, \int \cos^n xdx, \int \tan^n xdx, \int \cot^n xdx, \int \sec^n xdx, \int \cos ec^n xdx \ \& \int \sin^m x\cos^n xdx \ ,$$ with definite limits, differentiation under integral sign by Leibnitz rule.

Unit-IV: Differential Equation – 1   **12 Hrs**

Solutions of ordinary differential equations of first order and first degree: Linear differential equations, reducible to linear differential equation, exact equations, equation reducible to exact. Equations of first order and higher degree – non linear first order, higher degree – (Mention) solvable for p - solvable for y - solvable for x - Clairaut's equation - singular solution - Geometric meaning. Orthogonal trajectories in Cartesian and polar forms.

Text Books:

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.
   G K Ranganath, Textbook of B.Sc. Mathematics, Revised ed. New Delhi, India: S Chand and Company Ltd., 2011.
3. 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.
   G K Ranganath, Textbook of B.Sc., Mathematics, Revised ed. New Delhi, India: S Chand and Co., 2011.

Reference Books:

1. G B Thomas and R L Finney, Calculus and Analytical geometry, 10th ed.: Addison – Wesley, 2000.
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.

B18PS1040	Basic Statistics-I	L	T	P	C
Duration:14 Wks		2	1	0	3

Prerequisites:

Knowledge of basics mathematics- addition, subtraction, multiplication, division; probability basics, graphs.

Course Objectives:

1. To impart the basic knowledge of collection and tabulation of data.
2. To describe the univariate and bivariate data analysis.
3. To understand the concepts of probability.
4. To explore the basics of R software.

Course Outcomes:

The student will be able to
1. Tabulate the data and analyse them graphically.
2. Summarize the analysis of univariate and bivariate data.
3. Customize the data on the basis of probability.
4. Acquire the knowledge of R software in statistical analysis.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS1040	CO1	2	3	2	2	1	2	1	1	3	2
	CO2	2	3	2	3	1	2	1	1	2	3
	CO3	3	3	2	3	1	2	1	1	2	2
	CO4	2	2	2	3	2	2	1	1	2	2

Course Contents:

Unit-1: Statistical methods [12 Hrs]

Statistics-Meaning, importance, and scope of Statistics. Concepts of statistical population and sample. Collection of data: primary and secondary data. Types of measurements: Nominal, ordinal, ratio, and interval. Classification and tabulation- Construction of statistical table and frequency distribution. Graphical representation of data .

Unit-2: **Univariate data analysis:** [12 Hrs]

Measures of central tendency: Arithmetic mean, median, mode, geometric mean, harmonic mean and their properties. Quantiles: quartiles, deciles, percentiles. Absolute and relative measures of dispersion: range, standard deviation, mean deviation, quartile deviation, coefficient of variation and their properties. Moments: Raw and central moments, properties, and relationship between them. Skewness and kurtosis: concept, measures, and properties.

Unit-3: Elements of probability [12 Hrs]

Random experiment, trial, sample point, sample space, event, operations on events. Classical and relative frequency approach to probability - axiomatic approach to probability. Simple problems. Addition theorem of probability, conditional probability, independence of events multiplication theorem - Bayes theorem and its applications

Unit-4: [12 Hrs]

Bivariate data analysis: Bivariate data, Scatter diagram, Correlation, Karl Pearson's correlation coefficient and its properties. Spearman's rank correlation coefficient. Simple linear regression, regression co-efficients and their properties, regression lines, concept of errors, principle of least squares and fitting of polynomials and exponential curves

An introduction to R-Software

Computer software and utility, statistical softwares, R-software. Essentials, advantages, expressions and objects. Functions and arguments, materials and arrays, factors, data entry regarding from a text file, the data editor, interfacing to other programmes. Descriptive statistics and graphics-summary statistics, graphical display of distributions.

Text books:

1. Goon, A.M., Gupta, M.K., and Das Gupta, B. (2017). *Fundamentals of Statistics, Vol. I,* World Press, Calcutta
2. Montgomery, D.C. and Runger, G.C. (2013). *Applied Statistics and Probability for Engineers,* Wiley India, New Delhi.

3. W.J DeCoursey, Statistics and Probability for Engineering Applications, Elsevier Science (USA), 2009.
4. S.C Gupta and V.K Kapoor, Fundamentals of Mathematical Statistics, 11th Edn., (Reprint), Sultan Chand and Sons, 2007.
5. Miller, Irwin and Miller, Marylees, John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia, 2006.
6. Medhi, J. (1992).Statistical Methods: An introductory Text, New Age International, New Delhi.
7. Freund, J.E. and Walpole, R.E. (1987). Mathematical Statistics, 4/e,Prentice Hall Inc., New Jersey, USA.
8. Croxton, F.E, Cowden, D.J., and Klein, S. (1973). *Applied General Statistics*, 3/e, Prentice Hall Inc., New Jersey, USA.

Reference Books:

1. Ross, S.M (2003).*Introduction to Probability Models*, 10/e, Academic Press, UK.
2. Cooke, H.D., Craven, A.H., and Clarke, G.M. (1982): *Basic Statistical Computing*, Chapman and Hall, New York.
3. Anderson, T.W. and Sclove, S.L. (1978).*An Introduction to the StatisticalAnalysis of Data*, Houghton Mifflin and Co, New York.
4. Mood, A.M., Graybill, F.A., and Boes, D.C. (1974): *Introduction to the Theory of Statistics*, McGraw Hill, New York.
5. A.M Mood, F.A Graybill and D.C Boes, Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd
6. Snedecor, G.W. and Cochran, W.G. (1967). *Statistical Methods*, Iowa StateUniversity Press, USA.
7. Spiegel, M.R. (1967).*Theory and Problems of Statistics*, Schaum's PublishingSeries, London.

B18PS1060	Indian Constitution & Professional Ethics	L	T	P	C
Duration :14 Wks		2	0	0	2

Prerequisites:

Basics of Indian Constitution.

Course Objectives:

The objectives of this course are to:
1. Impart knowledge on Constitution of India.
2. Facilitate the understanding of Fundamental Rights, Duties and other Rights which is been given by our law.

3. Facilitate the understanding of Constitution perspective and make them face the world as a bonafide citizen.
4. Equip with the knowledge about ethics and also know about professional ethics.
5. Equip with the ethical standards followed by different companies.

Course Outcomes:

On completion of this course the student will be able to:
1. Explain the Indian constitutional provisions and folollow 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.
5. Demonstrate professional ethics and know about etiquettes about it.
6. Practice ethical standards of different companies which will increase their professional ability.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS1040	CO1										
	CO2										
	CO3										
	CO4										

Course content

UNIT -I: **6 Hrs**

Constitution of India

Making of Indian Constitution, features of Indian Constitution Preamble to the Constitution of India, Fundamental Rights under Part III; Rights to Equality, Right to Freedom, Right against Exploitation, Rights to Freedom of Religion, Cultural and Educational Rights, Constitutional

Remedies. Fundamental Duties of the Citizen, Significance and Characteristics. Elements of National Significance; National Flag, National Anthem, National Emblem.

UNIT -II: Legislature and Executive   6 Hrs

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

UNIT -III: Judiciary   6 Hrs

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

UNIT-IV: Professional Ethics   6 Hrs

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

Textbooks:

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

B18PS1070		L	T	P	C
Duration:14 Wks	**Physics lab- I**	0	0	2	2

Prerequisites:

Knowledge of Higher secondary/Pre University level Physics.

Course Objectives:

The objectives of this course are 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.
5. Develop the ability to effectively communicate the mechanical properties of materials

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.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2
B18PS1070	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

Lab Experiments

1. Bar pendulum: Determination of the acceleration due to gravity (graphical method).

2. Fly wheel: Determination of moment of inertia, mass and density.

3. Drop weight method: Determination of surface tension of water and kerosene.

4. Quincke's method: Determination of surface tension and angle of contact of mercury.

5. Determination of Young's modulus by single cantilever method.

6. Searle's double bar: Determination of young's modulus, the rigidity modulus, bulk

modulus and Poisson's ratio.

7. Torsional pendulum: Determination of the rigidity modulus.

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.

Text books:
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 – B.L. Worshnop and H.T. Flint (KPH)
4. Practical Physics – S. L. Gupta &V. Kumar (PragatiPrakashan).

B18PS1070		L	T	P	C
Duration:14 Wks	Mathematics Lab-I	0	0	2	2

Prerequisites:

Definition and types of matrices, differentiation and integration formulas and knowledge about differential equation, order and degree.

Course Objectives:

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

Course Outcomes:

1. Demonstrate the use of *Scilab* 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 differential equation
4. Exhibit the use of *Scilab* and *Maxima* to understand and interpret the concepts of reduction formula.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS1070	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 Contents:

1. Introduction to *Scilab*.
2. Introduction to *Scilab* commands connected with matrices.
3. Computation with matrices.
4. Row reduced echelon from and normal form.
5. Establishing consistency or otherwise and solving system of linear equations.
6. Introduction to *Maxima*
7. *Maxima* commands for derivatives and n^{th} derivatives.
8. Introduction to n^{th} derivative without Leibnitz rule.
9. n^{th} derivative with Leibnitz rule.
10. *Maxima* commands for reduction formula with or without limit.
11. *Scilab* and *Maxima* commands for plotting functions.
12. Solution of differential equations using *Scilab*/*Maxima* and plotting the solution – I.
13. Solution of differential equations using *Scilab*/*Maxima* and plotting the solution – II.

Suggested Text Books and References:

1. SCILAB: A Practical Introduction to Programming and Problem Solving [Print Replica] Kindle Edition by Tejas Sheth (Author).

2. The Maxima Book Paulo Ney de Souza Richard J. Fateman Joel Moses Cliff Yapp 19th September 2004

B18PS1080	Basic Statistics Lab-I	L	T	P	C
Duration:14 Wks		0	0	2	2

Prerequisites:

Knowledge of basics mathematics- addition, subtraction, multiplication, division; probability basics, graphs.

Course Objectives:

1. To have the basic knowledge of collection and tabulation of data.
2. To describe the univariate and bivariate data analysis.
3. To understand the concepts of probability.
4. To explore the basics of R software.

Course Outcomes:

The student will be able to
1. Tabulate the data and analyse them graphically.
2. Summarize the analysis of univariate and bivariate data.
3. Customize the data on the basis of probability.
4. Acquire the knowledge of R software in statistical analysis.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS1080	CO1	2	3	2	2	1	2	1	1	3	2
	CO2	2	3	2	3	1	2	1	1	2	3
	CO3	3	3	2	3	1	2	1	1	2	2
	CO4	2	2	2	3	2	2	1	1	2	2

Lab Experiments

(Demonstration of practicals using R-software)
   1. Construction of frequency distribution and graphical representation.
   2. Measures of central tendency I (Mathematical averages).
   3. Measures of central tendency II (Positional averages & Partition values).

4. Measures of dispersion I (Range, QD, MD,SD and CV).
5. Moments, skewness, and kurtosis for a frequency distribution.
6. Fitting of first, second, exponential and geometric curves.
7. Correlation and regression for ungrouped data and Spearman's rank correlation coefficient.
8. Correlation and regression for grouped data.
9. Computation of probabilities using combinatorial methods.
10. Application of addition rule, conditional probability, Baye's formula.

Text books:

9. Goon, A.M., Gupta, M.K., and Das Gupta, B. (2017). *Fundamentals of Statistics, Vol. I,* World Press, Calcutta
10. Montgomery, D.C. and Runger, G.C. (2013). *Applied Statistics and Probability for Engineers,* Wiley India, New Delhi.
11. W.J DeCoursey, Statistics and Probability for Engineering Applications, Elsevier Science (USA), 2009.
12. S.C Gupta and V.K Kapoor, Fundamentals of Mathematical Statistics, 11th Edn., (Reprint), Sultan Chand and Sons, 2007.
13. Miller, Irwin and Miller, Marylees, John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia, 2006.
14. Medhi, J. (1992).Statistical Methods*: An introductory Text,* New Age International, New Delhi.
15. Freund, J.E. and Walpole, R.E. (1987). Mathematical Statistics, 4/e,Prentice Hall Inc., New Jersey, USA.
16. Croxton, F.E, Cowden, D.J., and Klein, S. (1973). *Applied General Statistics*, 3/e, Prentice Hall Inc., New Jersey, USA.

Reference Books:

8. Ross, S.M (2003).*Introduction to Probability Models*, 10/e, Academic Press, UK.
9. Cooke, H.D., Craven, A.H., and Clarke, G.M. (1982): *Basic Statistical Computing*, Chapman and Hall, New York.
10. Anderson, T.W. and Sclove, S.L. (1978).*An Introduction to the StatisticalAnalysis of Data*, Houghton Mifflin and Co, New York.
11. Mood, A.M., Graybill, F.A., and Boes, D.C. (1974): *Introduction to the Theory of Statistics*, McGraw Hill, New York.
12. A.M Mood, F.A Graybill and D.C Boes, Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd
13. Snedecor, G.W. and Cochran, W.G. (1967). *Statistical Methods*, Iowa StateUniversity Press, USA.
14. Spiegel, M.R. (1967).*Theory and Problems of Statistics*, Schaum's PublishingSeries, London.

B18PS2011	Kannada - II	L	T	P	C	CH
Duration: 14 Weeks		3	1	0	3	4

Prerequisites:

ಭಾಷೆಯನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗು ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪ್ರ ಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಕಲೆ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ಮೂರು ಕ್ರೆ ಡಿಟ್ ಹೊಂದಿದೆ.

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.

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

Course Outcomes:

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

- ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳಿಡೆ ಗಮನಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
- ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾ ಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರ ೇರೇಪಿಸುತ್ತದೆ.
- ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2
B18PS2011	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		

Course Content:

UNIT-I   **12 Hrs**

ಚಂದ್ರ ಮತಿ ವಿಲಾಪ – ರಾಘವಾಂಕ
ಹಗೆಗಳನು ಹಿಂದಿದನು ಮನದೊಳಗೆ – ಕುಮಾರವ್ಯಾಸ
ಮುಳ್ಳಿಡಿದ ಮರನೇರಿದಂತಾದುದು – ಲಕ್ಷ್ಮೀಶ
ಗೋರಕ್ಷ ಪ್ರ ಸಂಗ – ಚಾಮರಸ

UNIT-II   **12 Hrs**

ತ್ರಿ ಪದಿಗಳು – 'ರ್ವಜ್ಞ ಹೆಳವನ
ಮುಂದಕ್ಕೆ ಲೇಸುಂಟು ನಮಗೆ – ಕಟ್ಟೆ ಗಿರಿಯಮ್ಮ
ಗುರುವಿನ ಗುಲಾಮನಾಗುವ ತನಕ – ಪುರಂದರ ದಾಸರು
ಕರೆದು ಕೊಟ್ಟನು ಶಾಪವನು – ಕನಕದಾಸರು

UNIT-III   **12 Hrs**

ಮೋಕ್ಷ ಹುಡುಕುತ್ತ ಪ್ರ ೀತಿಯ ಬಂಧನದಲ್ಲಿ – ಪಿ. ಲಂಕೇಶ
ರಾಮ–ಕೃಷ್ಣ–ಶಿವ – ಼ೀಹಿಯಾ
1. ಮಾನವೀಯತೆ ಅಂತಾರಲ್ಲಾ – ದೇವನೂರು ಮಹಾದೇವ
2. ಭೂತಾಯಿ ಮುನಿದಾಳು – ಮುರಾರಿ ಬಲ್ಲಾಳ

UNIT-IV

     12 Hrs

ನನ್ನೊಳಗಿನ ಹಾಡು ಕ್ಯೂಬಾ – ಜಿ.ಎನ್. ಮೋಹನ್

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು :
1. ಮುಗಳಿ ರಂ.ಶ್ರಿ ೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ , ಪ್ರ ಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸಂಗ್ರ ಹ. ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಚಾರಿತ್ರಿ ಕ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರ ಕಾಶಕರು 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. ಸಂಗ್ರ ಹ. ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಕನ್ನಡ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರ ಕಾಶಕರು ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2007

5. ಹಂಪ ನಾಗರಾಜಯ್ಯ, ಸಾಂಗತ್ಯ ಕವಿಗಳು, ಪ್ರ ಕಾಶಕರು ಸ್ಪಷ್ಟ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
6. ನಾರಾಯಣ ಪಿ.ವಿ. ಚಂಪೂ ಕವಿಗಳು, ಪ್ರ ಕಾಶಕರು ಸ್ಪಷ್ಟ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
7. ಕಾಳೇಗೌಡ ನಾಗವಾರ, ತ್ರಿ ಪದಿ, ರಗಳೆ ಮತ್ತು ಜಾನಪದ ಸಾಹಿತ್ಯ, ಪ್ರ ಕಾಶಕರು ಸ್ಪಷ್ಟ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
8. ಸಂ. ಬೆನಗಲ್ ರಾಮ ರಾವ್ ಮತ್ತು ಪಾನ್ಯಂ ಸುಂದರ ಶಾಸ್ತ್ರೀ, ಪುರಾಣ ನಾಮ ಚೂಡಾಮಣಿ, ಪ್ರ ಕಾಶಕರು ಪ್ರ ಸಾರಾಂಗ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ. 2010
9. ಡಾ. ಚಿದಾನಂದ ಮೂರ್ತಿ, ವಚನ ಸಾಹಿತ್ಯ, ಪ್ರ ಕಾಶಕರು ಸ್ಪಷ್ಟ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013
10. ಸಂ. ಬಸವರಾಜು ಎಲ್. ಸರ್ವಜ್ಞನ ವಚನಗಳು, ಪ್ರ ಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2012
11. ಸಂ. ಬಸವರಾಜು ಎಲ್. ಅಕ್ಕನ ವಚನಗಳು, ಪ್ರ ಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 1997
12. ಸಂ ಮರುಳಸಿದ್ದಪ್ಪ ಕೆ, ನಾಗರಾಜ ಕಿ.ರಂ. ವಚನ ಕಮ್ಮಟ, ಪ್ರ ಕಾಶಕರು ಸ್ಪಷ್ಟ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
13. ನರಸಿಂಹಾಚಾರ್. ಡಿ.ಎಲ್., ಪಂಪ ಭಾರತ ದೀಪಿಕೆ, ಪ್ರ ಕಾಶಕರು ಡಿ.ವಿ.ಕೆ ಮೂರ್ತಿ ಪ್ರ ಕಾಶನ, ಮೈಸೂರು. 2012
14. ರಂಜಾನ್ ದರ್ಗಾ, ಶರಣರ ಸಮಗ್ರ ಕ್ರಾ ಂತಿ, ಪ್ರ ಕಾಶಕರು. ಲೋಹಿಯಾ ಪ್ರ ಕಾಶನ, ಬಳ್ಳಾರಿ. 2015
15. ದೇಶಪಾಂಡೆ ಎಸ್.ಎಲ್. ಬೇಂದ್ರೆ ಶರೀಫರ ಕಾವ್ಯಾಯಾನ, ಪ್ರ ಕಾಶಕರು ದೇಸಿ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2013
16. ಸಂ. ಬಿ.ಎಸ್. ಕೇಶವರಾವ್. ಕೈಲಾಸಂ ಕನ್ನಡ ನಾಟಕಗಳು, ಪ್ರ ಕಾಶಕರು ಅಂಕಿತ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2005
17. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ , ಪ್ರ ಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರ ಂಥಮಾಲೆ, ಮೈಸೂರು – 2014
18. ಶಿವರುದ್ರ ಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರ ಕಾಶಕರು ಸ್ಪಷ್ಟ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

B18PS2012 Duration : 14 WKS	Hindi - II	L	T	P	C
		2	1	0	3

Prerequisites:

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

Course Objectives:

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

Course Outcomes:

अध्ययन की समाप्ति पर अध्येयता –
- सामाजिक मूल्य एवं नैतिक जवाबदेही को स्वीकार कर सकता है |
- साहित्य की प्रासंगिकता को जीवन में समझने की दक्षता रखता है |
- समाज में अंतर्निहित पद्धतियाँ एवं विचारधाराओं का व्याख्यान करने में सक्षम बन सकता है |

Mapping of Course Outcomes with programme Outcomes

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Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS2011	**CO1**					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			

Course Contents:

इकाई – 1: प्राचीन कविता, आधुनिक कविता   अध्यापन अवधियाँ : **12 hrs.**

1.कबीर के दोहे

2.कविता – जलियाँवाला बाग में बसंत- सुभद्राकुमारी चौहान

3.कविता – सुभाष की मृत्यु पर - धर्मवीर भारती

इकाई – 2: मध्यकालीन कविता, आधुनिक कविता   अध्यापन अवधियाँ : **12 hrs.**

4.रसखान के दोहे

5.कविता – हमारी जिन्दगी - केदारनाथ अग्रवाल

6.कविता – चलना हमारा काम है।- शिवमंगल सिंह सुमन

इकाई – 3: मध्यकालीन कविता, आधुनिक कविता   अध्यापन अवधियाँ : **12 hrs.**

7.मीराबाई के पद

8.कविता – मेरे सपने बहुत नहीं हैं- गिरिराज कुमार माथुर

9.कविता – अभी न होगा मेरा अंत – निराला

इकाई – 4: अनुवाद, निबंध   अध्यापन अवधियाँ : **12 hrs.**

अनुवाद : हिन्दी – अंग्रेजी

निबंध :

1.भारत में किसानों की स्थिति

2.निर्वाचन आयोग का महत्व

3.प्रेस की आजादी कितनी सार्थक

4.भारतीय नारी

5.साहित्य का उद्देश्य

सन्दर्भ ग्रन्थ :

1. पाठ्य पुस्तक – रेवा विश्वविद्यालय
2. **सुबोध व्यवहारिक हिन्दी – डॉ. कुलदीप गुप्त**
3. अभिनव व्यवहारिक हिन्दी – डॉ.परमानन्द गुप्त
4. हिन्दी साहित्य का इतिहास - डॉ. नागेन्द्र
5. आधुनिक हिन्दी साहित्य का इतिहास - डॉ. बच्चन सिंह
6. हिन्दी साहित्य का नवीन इतिहास - डॉ. लाल साहब सिंह
7. शुद्ध हिन्दी कैसे बोले कैसे लिखे- पृथ्वीनाथ पाण्डे
8. कार्यालय अनुवाद निदेशिका
9. हिन्दी निबंध संग्रह

B18PS2013	Additional English - II	L	T	P	C
Duration: 14Weeks		2	1	0	3

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills

Course Objectives:

1. Impart knowledge about multiple values of the society.
2. Equip with cultural understanding in the student to sharpen his/her social skills.
3. To ensure a gradual development of literary interest in the student.

Course Outcomes:

On completion of this course the student will be able to

1. Demonstrate a deep understanding of the society and its values.
2. Develop a constructive understanding of the cultural dimensions of the human world.
3. Demonstrate the understanding to become a responsible global citizen of tomorrow.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS2013	CO1					3	3	3	2		

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					3	3	3	3		
CO2					3	3	3	3		
CO3					3	3	3	2		
CO4					3	3	3	2		

Course Contents:

UNIT-I: Ecology & Environment   **12 hrs**

Literature: Toru Dutt - Casuarina Tree, Robert Frost – Stopping by Woods on a Snowy Evening

Tomas Rivera–The Harvest, C.V. Raman – Water – The Elixir of Life,

Language: Degrees of Comparison

UNIT-II: Voices from the Margin   **12 hrs**

Literature: Tadeusz Rozewicz – Pigtail Jyoti Lanjewar – Mother Sowvendra Shekhar Hansda – The

Adivasi Will Not Dance, Harriet Jacobs – Excerpt from *Incidents in the Life of a Slave Girl*

Language: Prefix and Suffix

UNIT-III: Women & Society   **12 hrs**

Literature: Kamala Das – An Introduction, Usha Navrathnaram – To Mother, Rabindranath Tagore

– The Exercise Book, Jamaica Kincaid – Girl, Writing Skills: Dialogue Writing

UNIT-IV: Popular Culture   **12 hrs**

Literature: Rudyard Kipling – The Absent-minded Beggar, Sir Arthur Conan Doyle – The Hound of

the Baskervilles, 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. Rama*n. PrabhatPrakashan, 2016.
5. Rozewicz, Tadeusz. *New Poems*. Archipelago, 2007.

B18PS2020	Functional English - II	L	T	P	C
Duration:14 Wks		2	1	0	3

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills

Course Objectives:

The objectives of this course are to:
1. To utilize the ability of using language skills effectively in real-life scenarios.
2. To develop the learners' competence in employability skills.
3. To improve the habit of writing, leading to effective and efficient communication.
4. To prioritize specially on the development of technical reading and speaking skills among the learners.

Course Outcomes:

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

1. Organize their opinions clearly and meaningfully.
2. Demonstrate the ability to speak appropriately in social and professional contexts.
3. Build inferences from the text.
4. Take part in interviews confidently.
5. Develop accurate writingskills using different components of academic writing.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2
B18PS2020	CO1					3	3	3	1		
	CO2					3	3	3	2		
	CO3					3	3	3	1		
	CO4					3	3	3	1		

Course Contents:

UNIT – I   **12 Hrs**

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Grammar: Active and passive voice; **Listening & Speaking:** Listening to informal conversations and interacting; **Reading:** Developing analytical skills; Deductive and inductive reasoning; **Writing:** Giving Instructions; Dialogue Writing

UNIT – II   12 Hrs

Grammar: Compound words; Phrasal verbs; **Listening:** Listening to situation based dialogues; **Speaking:** Group Discussions; **Reading:** Reading a short story or an article from newspaper; Critical reading; **Writing:** Formal letters (Accepting/ inviting/ declining); Personal letters (Inviting your friend to a function, congratulating someone for his / her success, thanking one's friends / relatives)

UNIT – III   12 Hrs

Grammar: Homonyms; Homophones; **Listening:** Listening to conversations; Understanding the structure of conversations; **Speaking:** Presentation Skills; **Reading**: Extensive reading; **Writing:** Report Writing (Feasibility/ Project report - report format – recommendations/ suggestions - interpretation of data using charts, PPT); Precise Writing.

UNIT – IV   12 Hrs

Grammar: Idioms; Single Word Substitutes; **Listening:** Listening to a telephone conversation; Viewing model interviews (face-to-face, telephonic and video conferencing); **Speaking:** Interview Skills, Mock Interviews; **Reading:** Reading job advertisements and the profile of the company concerned; **Writing:** Applying for a job; Writing a cover letter with résumé / CV.

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.

B18PS2030	Heat and Thermodynamics	L	T	P	C
Duration:14 Wks		2	1	0	3

To understand the basic laws of thermodynamics and their application to the non-flow and flow processes, thermodynamic properties of ideal and real gases and thermodynamic probability in gaseous medium

Course Objectives:

The objectives of this course are to:

1. Impart knowledge about basics of physics to solve problems involving mean velocity, probable velocity
2. Explain the relationship between the laws of radiation.
3. Familiarise with the principles of Thermodynamics for practical applications.
4. familiarize with fundamental laws of Thermodynamics.

Course Outcomes:

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

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS2030	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 Contents:

UNIT-I   **12 hrs**

Kinetic theory of gases: Degrees of freedom. Principle of equipartition of energy based on kinetic theory of gases, U=3/2 RT-derivation. Maxwell's law of distribution of molecular velocity (no derivation)-its interpretation. Mean free path-derivation probability of a molecule having mean free path. Andrews isothermals, Vander walls equations-expression for critical constants, calculation of mean velocity, most probable velocity and RMS velocity.

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.

UNIT-II   **12 hrs**

Radiation: 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.

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.

UNIT-III   **12 hrs**

Thermodynamics-I: Thermodynamic coordinates, concept of heat, work and internal energy, The Zeroth law of Thermodynamics, Indicator and phase diagrams, Isothermals and Adiabatic changes –Expression for work done, First law of Thermodynamics-mathematical formulation. **Second law of thermodynamics** – Kelvin Planck's statement and Clausius statement. The Carnot engine – expression for efficiency, the Carnot's theorem-its proof. Reversible and irreversible process, reversibility of carnot's cycle, Refrigerators-principle of working and coefficient of performance. Qualitative discussion on diesel engine.

UNIT-IV   **12 hrs**

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.

TextBooks:

1. Thermodynamics, R.C. Srivastava, Subit K. Saha &Abhay K. Jain Eastern Economy Edition.
2. Unified Physics Vol.2, Optics & Thermodynamics, Jai Prakash Nath&Co.Ltd., Meerut
3. Heat , Thermodynamics and Statistical Physics, Brij lal, Dr.N Subrahmanyam, P.S. Hemne, S Chand & Co
4. A text Book of Heat J.B.Rajam

Reference Books:

1. Brijal and Subramanyam : Heat and Thermodynamics 5th edition,2016
2. Heat and Thermodynamics for Degree Students. Author, J. B. Rajam. Edition, 9. Publisher, S. Chand, 1981.
3. D.S. Mathur :Heat, S.Chand, 1995
4. David Halliday, Robert Resnick, and Jearl Walker, Fundamentals of Physics, Sixth
5. Edition, John Wiley & Sons, Inc. Kittal & Dekkar

B18PS2040	Mathematics-II	L	T	P	C
Duration:14 Wks		2	1	0	3

Prerequisites:

Definition and properties of groups, concept of polar and Cartesian form, formulas and knowledge about differentiation and partial derivatives.

Course Objectives:

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. Make the students to be familiar with curve tracing.
4. Find derivative of functions of more than one variable.
5. Illustrate about the application areas of partial differentiation.

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Course Outcomes:

1. Explain the classification of finitely generated abelian groups and subgroups.
2. Demonstrate asymptotes and singular points
3. Gain knowledge on the concepts such as asymptotes, singular points and apply the same for curve tracing
4. Master the fundamental concepts of partial differentiation and apply Euler's theorem for homogeneous functions.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS2040	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 Contents:

Unit – I: Group Theory-1   **12 Hrs**

Binary operation, algebraic structure - problems on finding identity and inverse. Definitions of semi group and group, Abelian group - problems on finite and infinite groups. Properties of group with proof - standard problems on groups. A finite semi group with both the cancellation laws in a group. Any group of order less than five is abelian, permutation groups.

Unit-II: Differential Calculus -2   **12Hrs**

Polar coordinates - Angle between the radius vector and the tangent - Angle of intersection of curves (polar form) polar sub tangent and polar subnormal - perpendicular from pole on the tangent - Pedal equations. Derivative of an arc in Cartesian, parametric and polar forms.

Unit-III: Differential Calculus – 3   **12Hrs**

Curvature of plane curves - formula for radius of curvature in Cartesian, parametric, polar and pedal forms - centre of curvature - evolutes. Singular points - Asymptotes - Envelopes. General rules for tracing of curves.

Unit-IV: Partial Differentiation – 1   **12 Hrs**

Partial differentiation - Function of two and three variables - First and higher derivatives - Homogeneous functions - derivatives - Euler's theorem and its extension (with proof) - Total derivative and differential - Differentiation of implicit functions and composite functions - Problems - Jacobians - Properties of Jacobians problems.

Suggested Text Books:

1**.** The first course in Abstract Algebra by John B Fraleigh, Narosa Publishing House.

2**.** Topics in Algebra, I N Herstein, Wiley easter.

3**.** Shanthi Narayan and P.K.Mittal, Differential Calculus, Reprint. New Delhi: S.Chand & Company Ltd., 2011

4. G K Ranganath, Text book of B.Sc., Mathematics, Revised ed. New Delhi, India: S Chand and Co., 2011.

Reference Books:

1. G B Thomas and R L Finney, Calculus and Analytical geometry, 10th ed.: Addison – Wesley, 2000.

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 example, Reprint. Charleston, USA: BiblioBazaar, 2010.

5. M D Raisinghania, Ordinary and Partial Differential Equations, S Chand and Co. Pvt. Ltd., 2014.

B18PS2040	Basic Statistics-II	L	T	P	C
Duration:14 Wks		**2**	**1**	**0**	**3**

Prerequisites:

Knowledge of basics statistics-I, basics mathematics, differentiation, and integration.

Course Objectives:

1. To figure out the random variables using probability.
2. To illustrate discrete and continuous probability distributions.
3. To derive and demonstrate the limit theorems.

Course Outcomes:

The student will be able to

1. Describe the univariate and bivariate random variables using probability.
2. Analyze the probability distributions.

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3. Investigate the applications of limit theorems.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS2040	CO1	2	3	2	3	1	2	1	1	3	2
	CO2	3	3	2	3	1	2	1	1	3	3
	CO3	2	3	2	2	1	2	1	1	3	3

Course Contents:

Unit-1: **Univariate Random variable** [12 Hrs]

Distribution function, Discrete and continuous random variables, Probability mass and density functions - properties and illustrations. Expectation of a random variable and algebra of expectations and related results. Moments and moment generating function, properties and applications. Transformation of random variables.

Unit-2: Discrete probability distributions [12 Hrs]

Discrete uniform, Bernoulli, Binomial, Poisson, geometric, negative binomial, and hyper geometric distributions – mean, variance, moments, and MGF. Recursive relations for distributions – mean, variance, moments, MGF, and properties. Approximations of binomial, negative binomial and hyper geometric distributions.

Unit-3: Continuous probability distributions [12 Hrs]

Uniform, gamma, beta, exponential, Normal, and Cauchy distributions – mean, variance, moments, MGF, and properties.

Unit-4: [12 Hrs]

Bivariate random variables: Bivariate random variables, joint, marginal, and conditional distributions. Independence of random variables. Moments, covariance, and correlation coefficient. Properties of expectations of bivariate random variables. Mean and variance of linear combination of random variables. MGF of sum of independent random variables.

Limit theorems: Chebyschev's inequality – proof and its role in approximating probabilities. Convergence of binomial, Poisson, gamma distributions to Normal distribution. Statement of central limit theorem and its applications.

Text books:
1. Walpole, R.E., Myers, R.H., and Myers, S.L. (2017). *Probability and Statistics for Engineers andScientists,* 9/e, Pearson, New Delhi.
2. Mukhopadhyay, P.(2015): *Mathematical Statistics,* Books and Allied Pvt Ltd., Kolkata.

3. V.K Rohatgi and A.K Saleh Md. E. An Introduction to Probability and Statistics, 2nd Edn. (Reprint). John Wiley and Sons, 2009.
4. W.J DeCoursey, Statistics and Probability for Engineering Applications, Elsevier Science (USA), 2009.
5. AS Gaur and SS Gaur, Statistical Methods for practice and Research: A guide to data analysis using SPSS, 2nd Edition, Sage Publications Ltd, 2009.
6. S.C Gupta and V.K Kapoor, Fundamentals of Mathematical Statistics, 11th Edn., (Reprint), Sultan Chand and Sons, 2007.
7. Miller, Irwin and Miller, Marylees, John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia, 2006.
8. Gupta S.C and.Kapoor V.K: (2006). Fundamental Mathematical Statistics, Sultan Chand and Sons 88,Daryaganj , New Delhi.
9. Spiegel, M.R. (2001).*Probability and Statistics*, 4/e, Schaum's Outline Series, McGraw Hill, London.
10. Hogg, R. V. and Craig, A.T. (1995).*Introduction to Mathematical Statistics,* 5/e, Prentice Hall, New Jersey, USA.
11. Medhi, J. (1992).*Statistical Methods: An introductory text,* New Age International, New Delhi.
12. Goon A.M., Gupta, M.K., Das Gupta, B. (1991).*Fundamentals of Statistics,*Vol.I, World Press, Calcutta

Reference Books:

1. Bhattacharya, G. K. and Johnson, R.A. (1986): Statistical Concepts and Methods, John Wiley, New York.
2. Dudewicz, E.J. and Mishra, S.N.(1980). *Modern Mathematical Statistics,* John Wiley, New York.
3. Montgomery, D.C. and Runger, G.C. (2013). *Applied Statistics and Probability for Engineers,* Wiley India, New Delhi.
4. Rohatgi, V.K. and Saleh, A.K. Md. E. (2002). *An Introduction to Probability Theory and Mathematical Statistics*, 3/e, John Wiley, New York.
5. Ross, S.M (2003).*Introduction to Probability Models*, 10/e, Academic Press, UK.

B18PS2060	Environmental Sciences	L	T	P	C
Duration: 14 Wks		2	0	0	2

Prerequisites:

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

Course Objectives:

The objectives of this course are to:
1.   Familiarize students with environmental issues as how to conserve, preserve and protect our Environment.

Course Outcomes:

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

1   Analyze the environmental conditions and protect it.
2   Will observe the role of individual, government and NGO in environmental protection.
3   Get motivate to find new renewable energy resources with high efficiency through active research.
4   Analyze the ecological imbalances and protect it.
5   List the causes of environmental pollution & find ways to overcome them. Design pollution-controlled products.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS2060	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 Contents:

UNIT-I   **6 Hrs**

Multidisciplinary Nature of Environmental Studies: Introduction to Environment, objectives and guiding principles of environmental education, Components of environment, Structure of atmosphere, Sustainable environment/Development, Impact of technology on the environment in terms of modern agricultural practices and industrialization, Environmental Impact Assessment Environmental protection – Role of Government-Assignments of MOEF, Functions of

central and state boards, Institutions in Environment and People in Environment, Initiative and Role of Non-government organizations in India and world.

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

UNIT-II   **6 Hrs**

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

Self study: Case studies of London smog, Bhopal gas tragedy, marine pollutions and study of different 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   **6 Hrs**

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   **6 Hrs**

Ecology and ecosystem: Ecology-Definition, branches, objectives and classification, Concept of an ecosystem – Structure and functions, Characteristics of an Ecosystem-Ecosystem Resilience, Ecological succession and productivity, Balanced ecosystem, Components of ecosystem-abiotic and biotic, biological diversity.

Biogeochemical cycles and its environmental significance – Carbon, nitrogen and phosphorus cycle, Energy flow in ecosystem, food chains –types, food web & Ecological Pyramids.

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

Reference Books:
1. "Environmental Studies", by R.J. Ranjit Daniels and JagadishKrishnaswamy, (2017),
2. Wiley India Private Ltd., New Delhi, Co-authored &Customised by Dr.MS Reddy & Chandrashekar, REVA University.
3. "Environmental Studies", by R.J. Ranjit Daniels and JagadishKrishnaswamy, (2009),
4. Wiley India Private Ltd., New Delhi.
5. "Environmental Studies" by Benny Joseph, Tata McGraw – Hill Publishing
6. Company Limited.
7. Environmental Studies by Dr.S.M. Prakash, Elite Publishers Mangalore, 2007
8. Rajagopalan R. 2005," Environmental Studies – from Crisis to cure", Oxford University Press
9. Environmental Science by Arvind walia, Kalyani Publications, 2009.
10. Environmental Studies by AnilkumarDey and Arnab kumarDey.

B18PS2080	Physics Lab -II	L	T	P	C
Duration :14 Wks		**0**	**0**	**2**	**2**

Prerequisites:

Course Outline: This is a 2-credit course for second Semester consisting of 4 hours of teaching learning per week, inclusive of direct classroom teaching and practice in language lab.

Course Objectives:

The objectives of this course are to:
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:

On completion of the course, learners 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

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS2080	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 Contents:

Any **Eight** of the Following Experiments
1. Verification of Gaussian distribution law and calculation of standard deviation –Monte Carlo experiment.
2. Specific heat of a liquid by cooling – graphical method.
3. Determination of thermal conductivity of a bad conductor by Lee-Charlton method.
4. Verification of Stefan – Boltzmann law by using Ohm's law.
5. Determination of boiling point of a liquid using platinum resistance thermometer.
6. Determination of moment of inertia of irregular body using Torsional pendulum.
7. Determination of rigidity modulus by the static torsion method.
8. Determination of Young's modulus by uniform bending method.
9. Spiral spring: Determination of the acceleration due to gravity (graphical method).
10. Determination of wavelength of a given LASER by diffraction method

Text books:

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 – B.L. Worshnop and H.T. Flint (KPH)

4. Practical Physics – S. L. Gupta &V. Kumar (PragatiPrakashan).

B18PS2090	**Mathematics Lab -II**	**L**	**T**	**P**	**C**
Duration :14 Wks		**0**	**0**	**2**	**2**

Prerequisites:

Definition and properties of groups, concept of polar and Cartesian form, formulas and knowledge about differentiation and partial derivatives.

Course Objectives:

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:

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.

Mapping of Course Outcomes with programme Outcomes

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

B18PS2090											
	CO1	3	2	2		1				3	3
	CO2	3	2	2	1	1				3	3
	CO3	2	2	2	1	1				3	3
	CO4	3	2	2		1				3	3

Course Contents:

1. Creating a *Scilab* program (Simple examples).
2. Creating a *Maxima* program (Simple examples).
3. Verifying whether given operator is binary or not.
4. To find identity and inverse element of a group.
5. Construction of Caley –Table.
6. Plotting of standard Cartesian curves using *Scilab / Maxima*.
7. Plotting of standard Cartesian curves using *Scilab / Maxima*.
8. Plotting of standard parametric curves using *Scilab / Maxima*.
9. Plotting of standard polar curves using *Scilab / Maxima*.
10. Obtain partial derivative of some standard function.
11. Verification of Euler's theorem and its extension.
12. Verification of Jacobians.

Suggested Text Books and References:
1. SCILAB: A Practical Introduction to Programming and Problem Solving [Print Replica] Kindle Edition by Tejas Sheth (Author).
2. The Maxima Book Paulo Ney de Souza Richard J. Fateman Joel Moses Cliff Yapp 19th September 20

B18PS2090	Basic Statistics Lab-II	L	T	P	C
Duration:14 Wks		0	0	2	2

Prerequisites:

Knowledge of basics statistics-I, basics mathematics, differentiation, and integration.

Course Objectives:

1. To figure out the random variables using probability.
2. To illustrate discrete and continuous probability distributions.
3. To derive and demonstrate the limit theorems

Course Outcomes:

The student will be able to
1. Describe the univariate and bivariate random variables using probability
2. Analyze the probability distributions
3. Investigate the applications of limit theorems.

Mapping of Course Outcomes with programme Outcomes

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

Lab Experiments

(Demonstration using MS Excel and R software)

1. Univariate probability distributions: Expectation, moments, skewness, and kurtosis.
2. Bivariate probability distribution I: Moments and correlation coefficient.
3. Bivariate probability distribution II: Conditional expectation.
4. Applications of binomial distribution and fitting binomial distribution.
5. Applications of Poisson distribution and its fitting.
6. Computation of probabilities based on negative binomial, geometric, hyper geometric and discrete uniform distributions.
7. Applications of Normal distribution.
8. Fitting normal distribution.
9. Computation of probabilities based on rectangular and exponential distributions.
10. Applications of Chebyschev's inequality.

Text books:

1. 1.Walpole, R.E., Myers, R.H., and Myers, S.L. (2017). *Probability and Statistics for Engineers andScientists,* 9/e, Pearson, New Delhi.
2. Mukhopadhyay, P.(2015): *Mathematical Statistics,* Books and Allied Pvt Ltd., Kolkata.
3. V.K Rohatgi and A.K Saleh Md. E. An Introduction to Probability and Statistics, 2nd Edn. (Reprint). John Wiley and Sons, 2009.
4. W.J DeCoursey, Statistics and Probability for Engineering Applications, Elsevier Science (USA), 2009.
5. AS Gaur and SS Gaur, Statistical Methods for practice and Research: A guide to data analysis using SPSS, 2nd Edition, Sage Publications Ltd, 2009.
6. S.C Gupta and V.K Kapoor, Fundamentals of Mathematical Statistics, 11th Edn., (Reprint), Sultan Chand and Sons, 2007.

7. Miller, Irwin and Miller, Marylees, John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia, 2006.
8. Gupta S.C and.Kapoor V.K: (2006). Fundamental Mathematical Statistics, Sultan Chand and Sons 88,Daryaganj , New Delhi.
9. Spiegel, M.R. (2001).*Probability and Statistics*, 4/e, Schaum's Outline Series, McGraw Hill, London.
10. Hogg, R. V. and Craig, A.T. (1995).*Introduction to Mathematical Statistics,* 5/e, Prentice Hall, New Jersey, USA.
11. Medhi, J. (1992).*Statistical Methods: An introductory text,* New Age International, New Delhi.
12. Goon A.M., Gupta, M.K., Das Gupta, B. (1991).*Fundamentals of Statistics*,Vol.I, World Press, Calcutta

Reference Books:

1. Bhattacharya, G. K. and Johnson, R.A. (1986): Statistical Concepts and Methods, John Wiley, New York.
2. Dudewicz, E.J. and Mishra, S.N.(1980). *Modern Mathematical Statistics,* John Wiley, New York.
3. Montgomery, D.C. and Runger, G.C. (2013). *Applied Statistics and Probability for Engineers,* Wiley
4. India, New Delhi.
5. Rohatgi, V.K. and Saleh, A.K. Md. E. (2002). *An Introduction to Probability Theory and Mathematical Statistics*, 3/e, John Wiley, New York.
6. Ross, S.M (2003).*Introduction to Probability Models*, 10/e, Academic Press, UK.

Semester III:

B18PS3011	Language – II: Kannada	L	T	P	C
Duration: 14 Weeks		2	1	0	3

Prerequisites:

ಾಷೆಯನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗೂ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪ್ರ ಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಕಲೆ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ಮೂರು ಕ್ರೆ ಡಿಟ್ ಹೊಂದಿದೆ.

Course Objectives:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೂರನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯ ಪ್ರಕಾರಗಳಾದ ನವೋದಯ, ನವ್ಯ ಕಾವ್ಯ, ಸಣ್ಣಕಥೆಗಳು ಹಾಗು ನಾಟಕ ಸಾಹಿತ್ಯವನ್ನು

ಪದ್ಯವನ್ನಾಗಿ 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 ಅಭಿಪ್ರಾ ಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.

3. ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದ5.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2
B18PS3011	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		

Course Content:

UNIT – I   **[12 Hrs]**
ಮುದಿಯ ರಾಮಗೌಡ – ಬಿ. ಎಂ. ಶ್ರೀ
ಬೆಳಗು – ದ.ರಾ. ಬೇಂದ್ರೆ
ಕಲ್ಕಿ – ಕುವೆಂಪು
ರತ್ನ ಬೇವಾರ್ಸಿ – ಜಿ. ಪಿ. ರಾಜರತ್ನಂ

UNIT – II   **[12 Hrs]**
ಅವಧೂತ – ಸು.ರಂ.ಎಕ್ಕುಂಡಿ
ಮನೆಯಿಂದ ಮನೆಗೆ – ಕೆ.ಎಸ್.ನ
ನನ್ನ ಹಣತೆ – ಜಿ.ಎಸ್.ಎಸ್.
ಚಿರಂತನ ದಾಹ – ಚನ್ನವೀರ ಕಣವಿ

UNIT – III   **[12 Hrs]**
ಮುದ್ರಣ ಮನೋರಮೆ   ಸಲ್ಲಾಪ – ಮುದ್ರಣ
ದಾಳಿ ನಡೆದಾವ ಅಣ್ಣಾ – ಅಮರೇಶ ನುಗಡೋಣಿ
ಕೊನೆಯ ಗಿರಾಕಿ – ನಿರಂಜನ
ಅವನತಿ – ತೇಜಸ್ವಿ

UNIT – IV   **[12 Hrs]**
ಮೀಡಿಯಾ – ಅನುವಾದ. ಕೆ. ಮರುಳ ಸಿದ್ಧಪ್ಪ
ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು :

1. ಮುಗಳಿ ರಂ.ಶ್ರೀ. ೯., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ , ಪ್ರ ಕಾಶಕರು 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 ಪ್ರ ಜ್ಞೆ ಪ್ರ ಕಾಶಕರು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2014
4. ಡಾ. ಈ.ಎಸ್. ಆಮೂರ, ಕನ್ನಡ ಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರ   ಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
5. ಕೀರ್ತನಾಥ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರ   ಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಟ್ರ ಸ್ಟ್, ಧಾರವಾಡ. 2009
6. ಸಂ. ಬಿ.ಎಸ್. ಕೇಶವರಾವ್. ಕೈಲಾಸಂ ಕನ್ನಡ ನಾಟಕಗಳು, ಪ್ರ ಕಾಶಕರು ಅಂಕಿತ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2005
7. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ , ಪ್ರ   ಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರ ಂಥಮಾಲೆ, ಮೈಸೂರು –2014
8. ಆಧುನಿಕ ಕನ್ನಡ ಕಾವ್ಯ ಭಾಗ–2, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2004
9. ಶಿವರುದ್ರ ಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರ   ಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

B18PS3012	Language – II: Hindi	L	T	P	C
Duration: 14 Weeks		2	1	0	3

Prerequisites:

- अध्येता को, हिन्दी नाटक साहित्य का संक्षिप्त ज्ञान आवश्यक है ।
- हिन्दी साहित्य के इतिहास का संक्षिप्त ज्ञान की आवश्यकता है ।
- हिन्दी व्याकरण का अवबोधन आवश्यक है ।
- मीडिया लेखन की बुनियादी जानकारी चाहिए ।
- अंग्रेज़ी – हिन्दी अनुवाद से संबंधित जानकारी जरुरी है।

Course Objectives:

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 पद्धतियाँ एवं विचारधाराओं का व्याख्यान करने में सक्षम बन सकता है।
4. साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास कर सकता है।

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2
B18PS3012	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			

Course Content:

अध्ययन विषय सूची / पाठ्यक्रम

इकाई – 1: नाटक : एक और द्रोणाचार्य – डॉ. शंकर शेष   अध्यापन अवधियाँ : 12 hrs.

लेखक परिचय

प्रथम दृश्य

द्वितीय दृश्य

इकाई – 2: नाटक : एक और द्रोणाचार्य   अध्यापन अवधियाँ : 12 hrs.

तृतीय दृश्य

चतुर्थ दृश्य

89

इकाई – 3: नाटक : एक और द्रोणाचार्य | अध्यापन अवधियाँ : 12 hrs.

पंचम दृश्य

छठा दृश्य

इकाई – 4: अनुवाद, जनसंचार माध्यम | अध्यापन अवधियाँ : 12 hrs.

अनुवाद : अंग्रेजी - हिन्दी (समाचार पत्र से संबंधित)

जनसंचार माध्यम : स्वरुप, उद्भव और विकास |

सन्दर्भ ग्रन्थ :

- एक और द्रोणाचार्य – डॉ. शंकर शेष
- मीडिया लेखन एवं जनसंचार – डॉ.संजीव कुमार
- हिन्दी साहित्य का इतिहास - डॉ. नागेन्द्र
- आधुनिक हिन्दी साहित्य का इतिहास - डॉ. बच्चन सिंह
- हिन्दी साहित्य का नवीन इतिहास - डॉ. लाल साहब सिंह
- शुद्ध हिन्दी कैसे बोले कैसे लिखे- पृथ्वीनाथ पाण्डे
- कार्यालय अनुवाद निदेशिका
- मीडिया विमर्श – रामशरण जोशी
- संस्कृति, जनसंचार और बाजार – नन्द भरद्वाज

B18PS3013	Language – II: Additional English	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills

Course Objectives:

1. To attune young minds to concerns and issues which have a broad and wide scope of use and application to life.

2. To acquire a functional use of language in context.

3. To equip students to deliver formal and informal oral presentations to a variety of audiences in multiple contexts

4. To enable students to construct effective written message in various formats and styles.

5. To inculcate the habit of reading and writing leading to effective and efficient communication.

Course Outcomes:

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

2. Demonstrate ethical and political responsibilities in taking cognizance of issues relating to society, environment and media.

3. Develop a process-oriented approach to writing.

4. Make use of grammatical skills developed during the course aptly.

5. Utilize the target language effectively to focus on interpersonal skills and develop a good command over the language.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B18PS3013	CO1					3	3	3	2			
	CO2					3	3	3	3			
	CO3					3	3	3	2			
	CO4					3	3	3	2			

Course Content:

UNIT - 1

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-2

Interpersonal Skills

Remedial Grammar: Present Simple & Present Continuous; Activity & State VerbsWriting Skills: Official Letters, Activities: Making Apologies; Invitations & Making Arrangements, Literature: Ruskin Bond – Tiger in the Tunnel.

UNIT-3

Multi Tasking Skills

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-4

Communication Skills

Remedial Grammar: Collocations; Prepositions, Writing Skills: Precis WritingActivities: Offers, Suggestions & Requests, Literature: Avijit Pathak – Onscreen Magic.

B18PS3020	**Communicative English-1**	L	T	P	C
Duration: 14 WKS		2	1	0	3

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

Course Objectives:

1. To ensure the development of the linguistic prowess of the students.

2. To motivate the students to appreciate literature.

3. To promote an appreciable reading habit among the students.

Course Outcomes:

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

2. Demonstrate a thorough understanding of sensitive and critical social issues.

3. Develop their own ideas about their own society and culture.

4. Express their own opinions in a coherent and communicable manner.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B18PS3020	**CO1**					3	3	3	2			
	CO2					3	3	3	3			
	CO3					3	3	3	2			
	CO4					3	3	3	2			

Course Contents:

UNIT-1

Gender and Identity

Anne Sexton – Consorting with Angels, Eugene Field – The Doll's Wooing

SUNITiNamjoshi – Extracts from Feminist Fables, Ruth Vanita&SaleemKidwai (ed) – *Same Sex Love in India* (Extract), Charlotte Perkins Gilman – The Yellow Wallpaper.

UNIT-2

Love & Romance

Alfred Noyes – The Highway Man, William Shakespeare – Sonnet 116, Frank Richard Stockton – The Lady or the Tiger, Oscar Wilde – The Nightingale and the Rose, William Shakespeare – *Excerpt from Romeo and Juliet* (Balcony Scene)

UNIT-3

War &Trouma

Lord Alfred Tennyson – The Charge of the Light Brigade, TaufiqRafat – The Medal

Guy de Maupassant – Two Friends, SadaatHasanManto – Toba Tek Singh

Bertolt Brecht – Excerpt from *Fear and Misery of the Third Reich.*

UNIT-4

Childrens' Literature

William Wordsworth – Three Years She Grew in Sun and Shower, D.H. Lawrence – Discord in Childhood, Hans Christian Anderson – The Snow Queen, Anna Sewell – *The Black Beauty* (Extract) Rudyard Kipling – *The Jungle Book* (Extract)

References:

1. Sexton, Anne. The Complete Poems. Houghton Mifflin, 1999.

2. Namjoshi, SUNITi. Feminist Fables.Spinifex Press, 1998.

3. Vanita, Ruth &SaleemKidwai (ed.) Same Sex Love in India. Penguin India,2008.

4. Gilman, Charlotte Perkins. The Yellow Wallpaper. Rockland Press, 2017.

Gale, Cengage Learning. A Study Guide for Alfred Noyes's "The Highwayman". Gale, Study Guies, 2017. (Kindle Edition Available)

5. Shakespeare, William. Poems and Sonnets of William Shakespeare. Cosimo Classics, 2007.

6. Stockton, Frank Richard. The Lady, or the Tiger? Create space Independent Publications, 2017.

7. Wilde, Oscar. The Collected Works of Oscar Wilde. Wordsworth Editions Ltd., 1997.

Shakespeare, William. Romeo and Juliet. Rupa, 2001.

8. Tennyson, Lord Alfred. The Complete Works of Alfred Tennyson. Forgotten Books, 2017.

9. Owen, Wilfred. The Poems of Wilfred Owen. Wordsworth Editions Ltd., 1994.

10. Maupassant, Guy de. Guy de Maupassant-The Complete Short Stories. Projapati, 2015.

Manto, SadaatHasan. Manto: Selected Short Stories. RHI, 2012.

11. Brecht, Bertolt. Fear and Misery in the Third Reich. Methuen Drama, 2012.

12. Ricks, Christopher. Metaphysical Poetry. Penguin, 2006.

13. Anderson, Hans Christian. Fairy Tales by Hans Christian Anderson. Read Books, 2010.

14. Sewell, Anna. The Black Beauty. Maple Press, 2014.

15. Kipling, Rudyard. The Jungle Book. Amazing Reads, 2018.

B18PS3030	Waves and Optics	L	T	P	C

Duration: 14Weeks		2	1	0	3

This is a introductory physics course which covers topics in simple harmonic motion waves, basic theory of light, optics, optical instruments and optical phenomenon like diffraction, interference and polarization.

Course Objectives:

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:

On 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.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS3030	CO1	3	3	3	3	1				3	3
	CO2	3	3	3	3					3	3

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

Course Contents:

UNIT-I   **12 hours**

Waves

Waves in one dimension. Differential equation of wave motion. Relation between amplitude and intensity. Expression for velocity of progressive waves in a medium. Newton's formula, Laplace's correction. Longitudinal vibrations in a rod. Expression for frequency of vibration of a stretched string-harmonics. Kundt's tube experiment

Superposition of simple harmonic motions: Lissajou's figures, Equation for damped vibrations, Forced vibration, Solution in exponential form.

Resonance: Expression for amplitude and phase at resonance.

UNIT-II   **12 hours**

Theory of light: Huygen's principle. Explanation of the laws of reflection and refraction. Lens formula.

Optics: Kerr effect. Determination of velocity of light by Kerr cell method, Defects of lenses.

Optical Instruments: Achromatic combinations of lenses. Huygen's and Ramsden's eye pieces. Resolving and magnifying power of the telescope and microscope (qualitative treatment only).

UNIT-III   **12 hours**

Interference: Theory of interference. Expression for fringe width. Coherent sources. Interference by division of wave front and division of amplitude. Fresnel's biprism. Lloyd's mirror. Thin films of uniform thickness. Newton's rings. Interference at a wedge. Michelson's interferometer - Measurement of λ and $d\lambda$.

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.

UNIT-IV   **12 hours**

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. Retarding plates. Production and analysis of linearly. Circularly and elliptically polarized light. Optical activity, Fresnel's theory, Rotatory polarization. Use of bi quartz. Applications of Polaroid's. Construction and working of Polarimetry, Specific rotation.

Books Recommended:

1. Halliday and Resnick: Fundamentals of Physics, 9th edition, Wiley India, 2011.

2. R. H. Dittaman and M. W. Zemansky: Heat and Thermodynamics, 7th edition, The
   McGraw-Hill companies, 2007.

3. S. J. Blundell and K. M. Blundell: Concepts in Thermal Physics, 2nd edition, Oxford   University Press, 2006.

4. Brijlal ,N. Subramanyam P.S. Hemne: Heat Thermodynamics and Statistical Physics, 1st edition. S Chand Publishing, 2007.

5. S C Gupta: Thermodynamics, 1st edition, Pearson, 2005.

6. Satya Prakash: Optics and Atomic Physics, 11th, Ratan Prakashan Mandir, 1994.

7. C. L. Arora: Refresher Course in Physics Vol I, S Chand publishing, 2011.

8. S. R. Shankara Narayana: Heat and Thermodynamics, 2nd edition, Sulthan Chand and Sons, 1990.

B18PS3030		L	T	P	C
Duration:14 Wks	Mathematics –III	2	1	0	3

Prerequisites:

Differentiation, integration, basic concepts of differential equations, basic arithmetic and algebra.

Course Objectives:

1. To develop the knowledge about the subgroups and group homomorphisms

2. To familiarize with higher order ordinary differential equations.
3. To understand the concept of Laplace transforms.
4. To familiarize with Inverse Laplace transforms.

Course Outcomes:

1. To classify and generate sub groups and normal subgroups.
2. To solve higher order linear differential equations.
3. To apply the knowledge of Laplace transforms.
4. To discuss Inverse Laplace trnasforms.

Course Outcomes:

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS3030	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 Contents:

Unit-I: Group Theory – 2   **12 Hrs**
Normal Sub groups, homomorphism, isomorphism, Left Coset, Right Coset, Kernal of homomorphism. Sub groups – theorems on sub groups (With proof) Problems.

Unit-II: Differential Equations – 2   **12 Hrs**
Higher order linear differential equations, Solution of homogeneous linear differential equations of order n with constant coefficients. Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. Method of undetermined coefficients; Method of variation of parameters; Linear differential equations with non-constant coefficients; The Cauchy-Euler equation System of linear differential equations: Solution of a system of linear equations with constant coefficients.

Unit-III: Laplace Transformation   **12 Hrs**

Definition and basic properties Laplace transform of some common functions and Standard results –Laplace transform of periodic functions- Laplace transforms of derivatives and the integral of function- Laplace transforms of Heaviside function/Unit step function, convolution theorem (with proof).

Unit-IV: Inverse Laplace Transformation **12 Hrs**

Inverse Laplace transforms properties of inverse Laplace transform, Solution of differential equation using Laplace transforms.

Inverse Laplace transforms properties of inverse Laplace transform, finding inverse Laplace transform using Convolution theorem, Solution of differential equation using Laplace transforms.

Text Books:

1) John B Fraleigh, The first course in Abstract Algebra, Narosa Publishing House.
2) I N Herstein, Topics in algebra, Wiley easter.
3) G K Ranganath, Text book of B.Sc., Mathematics, Revised ed. New Delhi, India: S Chand and Co., 2011.
4) Raisinghania M.D., Laplace and Fourier Transforms. New Delhi, India: S. Chand and Co. Ltd., 1995,

Reference Books:

1) S Narayanan and T K ManicavachogamPillay, Differential Equations, S V Publishers Private Ltd., 1981.
2) Erwin Kreyszig, Advanced Engineering Mathematics, 8th ed. New Delhi, India: Wiley India Pvt. Ltd., 2010.
3) Murray R, Spiegel L: Laplace Transforms (Schaum Series).

B18PS3040	Statistical Inference-I	L	T	P	C
Duration:14 Wks		2	1	0	3

Prerequisites:

Knowledge of basics statistics-I & II, basics mathematics, differentiation, and integration.

Course Objectives:

1. To characterize the sampling distributions.
2. To classify the different techniques of point estimation for estimating the parameter values.

3. To describe the interval estimation and simulation.

Course Outcomes:

The student will be able to
1. Define the sampling distributions.
2. Differentiate the different techniques of point estimation for estimating the parameter values.
3. Compare the parameters of interval estimation and simulation.

Mapping of Course Outcomes with programme Outcomes

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

Course Contents:

Unit-1: Sampling distributions   [12 Hrs]
Definitions of random sample, parameter and statistic, sampling distribution of a statistic, sampling distribution of sample mean and variance, standard errors of sample mean, sample variance and sample proportion. Chi-square, t, and F distributions – mean, variance, M.G.F, and properties. Relation among t, F and chi-square distributions.

Unit-2: Point estimation-I   [12 Hrs]
Families of distributions - location and scale families. Single parameter exponential family. Point estimation. Concepts of estimator and estimate. Criteria for estimators: Unbiasedness, consistency. Invariance property of consistent estimators. Efficiency and relative efficiency. Mean square error as a criterion for comparing estimators.

Unit-3: Point estimation-II   [12 Hrs]
Sufficient statistic. Statement of Neyman - Factorization theorem. Fisher information function. Statement of Cramer - Rao inequality and its applications. Minimum variance unbiased estimator and minimum bound estimator.
Methods of point estimation: Maximum likelihood and method of moment estimation. Properties of maximum likelihood and moment estimators and examples

100

Unit-4: **Interval estimation and Simulation** [12 Hrs]

Interval estimation: Confidence interval, confidence coefficient, shortest confidence interval. Method of constructing confidence intervals using pivotal quantity. Construction of confidence intervals for mean, difference of two means, variance and ratio of variances, proportion, difference of two proportions, and correlation coefficient.

Simulation: Introduction to simulation. Monte Carlo method. Generation of random observations from uniform, exponential, Normal, Cauchy, binomial, Poisson distributions. Simple illustrations.

Text books:

1. Walpole, R.E., Myers, R.H., and Myers, S.L. (2017). *Probability and Statistics for Engineers and Scientists,* 9/e, Pearson, New Delhi.
2. Mukhopadhyay, P.(2015): *Mathematical Statistics,* Books and Allied (P) Ltd., Kolkata.
3. Montgomery, D.C. and Runger, G.C. (2013). *Applied Statistics and Probability for Engineers,* WileyIndia, New Delhi.
4. Spiegel, M.R. (2001).*Probability and Statistics*, 4/e, Schaum's Outline Series, McGraw Hill, London.
5. Hogg, R. V. and Craig, A.T. (1995).*Introduction to Mathematical Statistics,* 5/e, Prentice Hall, New Jersey, USA.
6. Medhi, J. (1992).*Statistical Methods: An introductory text,* New Age International, New Delhi.
7. Goon A.M., Gupta, M.K., Das Gupta, B. (1991).*Fundamentals of Statistics*,Vol.I, World Press, Calcutta.

Reference Books:

1. Ross, S.M (2003). *Introduction to Probability Models*, 10/e, Academic Press, UK.
2. Rohatgi, V.K. and Saleh, A.K. Md. E. (2002). *An Introduction to Probability and Statistics*, 2/e, John Wiley, New York.
3. Bhattacharya, G. K. and Johnson, R.A. (1986): *Statistical Concepts and Methods*, John Wiley, New York.
4. Casella, G. and Berger, R.L. (1990). *Statistical Inference*, Duxbury Press, Belmont, California, USA. (2nd Edition).
5. Dudewicz, E.J. and Mishra, S.N.(1980). *Modern Mathematical Statistics,* John Wiley, New York.

B18PS3061	Physics in Everyday Life	L	T	P	C

			4	0	0	4
Duration:14 Wks						

Prerequisites:

Basics of Physics and its importance in everyday life

Course Objectives:

The objectives of this course are 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 Outcomes:

On successful completion of this course, the student is expected to be able to:
1. Postulate the basics of principles and working of electrical devices in our daily life
2. Explain the physical phenomena of sensors and electronic components
3. Analyse the formation of clouds and cyclic process
4. Compresence the properties of smart materials

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS3061	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 Contents:

UNIT-I: Gadgets in daily life   **12 hrs**
Principle of levers, Frictional force, Electric fans, motors and bulbs, Washing Machines, Kitchen Electronics, Microwave, Dishwasher, Induction Stoves, Smart Refrigerators, Smart alarms, Smart

elevator, Smart floor, Smart locks, batteries. working principle of Microphone, Loudspeaker, AM and FM receiver and radio, Basics of Smart phones and Digital Cameras

UNIT-II: Applications of Electromagnetic waves   **12 hrs**

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

UNIT-III: Atmosphere   **12 hrs**

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   **12 hrs**

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

Recommended Books:

1. Thomas L Floyd "Electronic Devices" 10th Edition Pearson Education Asia 2018.
2. Jordan Frith, " Smartphones as Locative Media ", Wiley. 2014
3. M. I .Skolnik —Introduction to Radar Systems, Tata McGraw Hill 2006.
4. A Short Course in Cloud Physics; R. R. Rogers
5. The Physics of Clouds; B. J. Mason
6. Dennis C Brewer, " Home Automation", Que Publishing 2013
7. T.Pratt, C. Bostian and J.Allnutt; —Satellite Communications, John Wiley and Sons, Second Edition., 2003
8. S.P Basavaraju- Engineering physics -2016.

B18PS3070	**Physics Lab - III**	L	T	P	C
Duration:14 Wks		0	0	2	2

Prerequisites:

This is a laboratory course which covers experiments related to simple harmonic motion waves, basic theory of light and optical phenomenon like diffraction, interference and polarization.

Course Objectives:

The objectives of this course are to:
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.

Course Outcomes:

On successful completion of this course, the student is expected to 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 constant values related to sound.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO 2
B18PS3070	**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 Contents:

Any **Eight** of the Following Experiments

1. Kundt's tube experiment – Velocity of sound in air at room temperature.

2. Study of stationary wave on a stretched string – Determination of speed of the transverse waves

   over the sonometer wire.

3. Characteristics of microphone – loudspeaker system – Determination of Velocity of sound at room

   temperature.

4. Newton's rings – Determination of radius of curvature of a plano-convex lens.

5. Air wedge – Determination of thickness of a thin paper/diameter of a thin wire.

6. Helmholtz resonator – Determination of frequency of a tuning fork.

7. Diffraction grating – Determination of grating constant and wavelength (minimum deviation

   method).

8. Diffraction at a straight wire – Determination of diameter of a wire.

9. Cauchy's constants using spectrometer.

10. Polarization – Determination of unknown concentration of sugar solution by graphical method using a polarimeter.

11. Determination of refractive indices of calcite and quartz crystal using spectrometer and sodium light.

Text books:

3. Thiruvadigal, J. D., Ponnusamy, S.Sudha.D. and Krishnamohan M., "Physics for Technologists", Vibrant Publication, Chennai, 2013

4. R.K.Shukla and Anchal Srivastava, "Practical Physics", 1st Edition, New Age International (P) Ltd, New Delhi, 2006.

Reference Books:

5. G.L.Souires, "Practical Physics:", 4th Edition, Cambridge University, UK, 2001.

6. D. Chattopadhyay, P. C. Rakshit and B. Saha, "An Advanced Course in Practical Physics", 2nd ed., Books & Allied Ltd., Calcutta, 1990.

7. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)

8. Practical Physics – S. L. Gupta &V. Kumar (PragatiPrakashan).

B18PS3070	Mathematics Lab-III	L	T	P	C
Duration:14 Wks		0	0	2	2

Prerequisites:

Differentiation, integration, basic concepts of differential equations, basic arithmetic and algebra.

Course Objectives:

1. Acquire skill in solving problems on Differential Equations using MAXIMA.
2. Gain proficiency in using MAXIMA to solve problems on Differential Equations and its applications. Obtain skill in creating programs on groups using *Scilab* and *Maxima*.

Course Outcomes:

1. Acquire proficiency in using Maxima to study Differential Equations.
2. Demonstrate the use of Maxima to understand and interpret the core concepts in Differential Equations.
3. Find general and particular solutions of first and second order Differential Equations and to sketch the graph for solutions.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS3070	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

Course Contents:

1. To verify whether given subgroup it is a normal subgroup of a group G
2. To verify a given faction homomorphisom or not.
3. To verify a given onto homomorphison of a group is isomorphism or not.
4. To verify Lagrange's theorem.
5. To find left and right cost (examples)
6. To find the solution to the differential equation
7. To find the Laplace transform of given function
8. To find the inverse Laplace Transform of given function
9. To solve ODE using Laplace Transform.
10. To find the solution to the differential equation.

Reference Books:

4) S Narayanan and T K ManicavachogamPillay, Differential Equations, S V Publishers Private Ltd., 1981.
5) Erwin Kreyszig, Advanced Engineering Mathematics, 8th ed. New Delhi, India: Wiley India Pvt. Ltd., 2010.
6) Murray R, Spiegel L: Laplace Transforms (Schaum Series).

B18PS3080	Statistical Inference Lab-I	L	T	P	C
Duration:14 Wks		0	0	2	2

Prerequisites:

Knowledge of basics statistics-I & II, basics mathematics, differentiation, and integration.

Course Objectives:

1. To characterize the sampling distributions.
2. To classify the different techniques of point estimation for estimating the parameter values.
3. To describe the interval estimation and simulation.

Course Outcomes:

The student will be able to
1. Define the sampling distributions.
2. Differentiate the different techniques of point estimation for estimating the parameter values.
3. Compare the parameters of interval estimation and simulation.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS3080	CO1	2	2	2	2	1	1	1	1	2	2
	CO2	2	3	3	3	1	2	1	1	3	3
	CO3	2	3	3	2	1	2	1	1	3	2

Lab Experiments

(Demonstration using MS Excel and R Software)
1. Drawing random samples using random number tables.
2. Application of the central limit theorem.
3. Point estimation of parameters and obtaining estimates of standard errors.
4. Comparison of estimators by plotting mean square error.
5. Computing maximum likelihood estimates -1
6. Computing maximum likelihood estimates - 2
7. Computing moment estimates
8. Constructing confidence intervals based on large samples.
9. Constructing confidence intervals based on small samples.
10. Generating random samples from discrete and continuous distributions.

Text books:
1. Walpole, R.E., Myers, R.H., and Myers, S.L. (2017). *Probability and Statistics for Engineers and Scientists,* 9/e, Pearson, New Delhi.
2. Mukhopadhyay, P.(2015): *Mathematical Statistics,* Books and Allied (P) Ltd., Kolkata.

3. Montgomery, D.C. and Runger, G.C. (2013). *Applied Statistics and Probability for Engineers,* WileyIndia, New Delhi.
4. Spiegel, M.R. (2001).*Probability and Statistics*, 4/e, Schaum's Outline Series, McGraw Hill, London.
5. Hogg, R. V. and Craig, A.T. (1995).*Introduction to Mathematical Statistics,* 5/e, Prentice Hall, New Jersey, USA.
6. Medhi, J. (1992).*Statistical Methods: An introductory text,* New Age International, New Delhi.
7. Goon A.M., Gupta, M.K., Das Gupta, B. (1991).*Fundamentals of Statistics,*Vol.I, World Press, Calcutta.

Reference Books:

1. Ross, S.M (2003). *Introduction to Probability Models*, 10/e, Academic Press, UK.
2. Rohatgi, V.K. and Saleh, A.K. Md. E. (2002). *An Introduction to Probability and Statistics*, 2/e, John Wiley, New York.
3. Bhattacharya, G. K. and Johnson, R.A. (1986): *Statistical Concepts and Methods*, John Wiley, New York.
4. Casella, G. and Berger, R.L. (1990). *Statistical Inference*, Duxbury Press, Belmont, California, USA. (2nd Edition).
5. Dudewicz, E.J. and Mishra, S.N.(1980). *Modern Mathematical Statistics,* John Wiley, New York.

Semester IV:

B18PS4011	Language-II: Kannada	L	T	P	C
Duration :14 Wks		2	1	0	3

Prerequisites:

- ಕನ್ನಡ ಭಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಅಗತ್ಯ.
- ಭಾಷೆಯನ್ನು ಓದಲುವ ಎತ್ತು ಬರೆಯಲು ತಿಳಿದಿರ ಬೇಕು.
- ಪದವಿಪೂರ್ವ ಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರ ಬೇಕು.

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 ಅಭಿಪ್ರಾ ಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರ ೇರೇಪಿಸುತ್ತದೆ.

3. ಸಾಮಾಜಿಕ ಅರಿವು ಮೂಡಿಸುತ್ತದೆ.

4. ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PS O3
B18PS4011	CO1					2	3					
	CO2					2	3					
	CO3						3					
	CO4							3	2			

Course Contents:

ಘಟಕ – ೧
        12 ಊಡಿ
ಕಟ್ಟುವೆವು ನಾವು – ಅಡಿಗರು
ಬುದ್ಧಿವಂತರಿಗೆ ಕನಸು ಬಿದ್ದರೆ – ಎ.ಕೆ.ರಾಮನುಜನ್
ಕುರಿಗಳು ಸಾರ್ ಕುರಿಗಳು – ನಿಸಾರ್ ಅಹಮದ್ ಮಾಲತಿ
ನಾ ಬರಿ ಭ್ರೂ ಣವಲ್ಲ – ಪಟ್ಟಣಶೆಟ್ಟಿ

ಘಟಕ – ೨   12
ಊಡಿ

ಸ್ವಾತಂತ್ರ ಗೀತೆ – ಚಂಪಾ
ಜನಪದ ಕಥೆಗಳ ರಾಕ್ಷಸ – ಕಂಬಾರ
ದಲಿತರು ಬರುವರು ದಾರಿಬಿಡಿ – ಸಿದ್ಧಲಿಂಗಯ್ಯ
ಕಟ್ಟಡದ ಕೆಲಸಗಾರರು – ಎಚ್ ಎಸ್ ಶಿವಪ್ರ ಕಾಶ

ಗಟಿು – ಖಖಖ
12 ಊಡಿ
ಹಸಿರು ಹೊಸಕುವ ಗಣಿಗಳು – ಯಲ್ಲಪ್ಪ ರೆಡ್ಡಿ
ವಚನಕಾರರ ವಿಚಾರ ಕ್ರಾ ಂತಿ – ಜಿ.ಎಸ್.ಎಸ್
ಜಾಗತೀಕರಣದ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ಗಾಂಧೀಜಿಯ ಪ್ರ ಸ್ತುತತೆ – ಸಿ. ನಾಗಣ್ಣ
ಬಂಡವಾಳ ಶಾಹಿ ನೆಲೆ – ಬರಗೂರು

ಗಟಿು – ಖಗಿ   **12**
ಊಡಿ
ಸಂಸ್ಕಾರ – ಅನಂತಮೂರ್ತಿ
ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು:

1. ಮುಗಳಿ ರಂ.ಶ್ರಿ ೕ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ೕ, ಪ್ರ ಕಾಶಕರು 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, ಪ್ರ ಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
4. ರಂಜಾನ್ ದರ್ಗಾ, ಶರಣರ ಸಮಗ್ರ ಕ್ರಾ ಂತಿ, ಪ್ರ ಕಾಶಕರು. ಲೋಹಿಯಾ ಪ್ರ ಕಾಶನ, ಬಳ್ಳಾರಿ. 2015
5. ವಸಿಷ್ಠ., ರತ್ನಾಕರವರ್ಣಿಯ ಭರತೇಶ ವೈಭವ, ಪ್ರ ಕಾಶಕರು ಚೇತನ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 1999
6. ಡಾ. ಅರವಿಂದ ಮಾಲಗತ್ತಿ, ಸಾಹಿತ್ಯ ಸಂಸ್ಕೃತಿ ಮತ್ತು ದಲಿತ ಪ್ರ ಜ್ಞೆ, ಪ್ರ ಕಾಶಕರು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2014
7. ಡಾ. ಈ.ಎಸ್. ಆಮೂರ, ಕನ್ನಡ ಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರ ಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
8. ಕೀರ್ತಿನಾಥ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರ ಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಟ್ರ ಸ್ಟ್, ಧಾರವಾಡ. 2009
9. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ೕ, ಪ್ರ ಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರ ಂಥಮಾಲೆ, ಮೈಸೂರು –2014
10. ಸಂ. ಡಾ! ಸಿ. ಆರ್. ಚಂದ್ರ ಶೇಖರ್, ಮುಂದಾಳುತನದ ಲಕ್ಷಣಗಳನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವುದು ಹೇಗೆ?, ಪ್ರ ಕಾಶಕರು ನವಕರ್ನಾಟಕ ಪಬ್ಲಿಕೇಷನ್ಸ್ ಪ್ರೈ ೖವೆಟ್ ಲಿಮಿಟೆಡ್. 2010
11. ಆಧುನಿಕ ಕನ್ನಡ ಕಾವ್ಯ ಭಾಗ–2, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2004
12. ಶಿವರುದ್ರ ಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರ ಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

B18PS4012	Language-II: Hindi	L	T	P	C	CH
Duration :14 Weeks		2	1	0	3	4

Prerequisites:

- अध्येता को, हिन्दी खंडकाव्य का संक्षिप्त ज्ञान आवश्यक है |
- हिन्दी साहित्य के इतिहास का संक्षिप्त ज्ञान की आवश्यकता है |
- हिन्दी व्याकरण का अवबोधन आवश्यक है |

Course Objectives:

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 अकृतिम 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 पद्धतियाँ एवं विचारधाराओं का व्याख्यान करने में सक्षम बन सकता है |
4. साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास कर सकता है |

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2
B18PS4012	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			

Course Contents:

अध्ययन विषय सूची / पाठ्यक्रम

इकाई – 1: खंड काव्य – संशय की रात - नरेश मेहता   अध्यापन अवधियाँ : 12 hrs.

कवि परिचय

प्रथम सर्ग

द्वितीय सर्ग

इकाई – 2: खंड काव्य – संशय की रात   **अध्यापन अवधियाँ :** 12 hrs.

तृतीय सर्ग

 चतुर्थ सर्ग

इका ई – 3: खंड काव्य – संशय की रात   **अध्यापन अवधियाँ :** 12 hrs.

 पंचम सर्ग

 छठा सर्ग

 सप्तम सर्ग

इकाई – 4: व्याकरण : अलंकार , **सिनिमा रिव्यू**   **अध्यापन अवधियाँ :** 12 hrs.

 व्याकरण : अलंकार

सिनिमा रिव्यू :

दंगल हिन्दी मीडियम, सत्याग्रह, और चेक दे इंडिया |

सन्दर्भ ग्रन्थ :

- संशय की एक रात – नरेश मेहता
- हिन्दी साहित्य का इतिहास - डॉ. नागेन्द्र
- आधुनिक हिन्दी साहित्य का इतिहास - डॉ. बच्चन सिंह
- हिन्दी साहित्य का नवीन इतिहास - डॉ. लाल साहब सिंह
- शुद्ध हिन्दी कैसे बोले कैसे लिखे- पृथ्वीनाथ पाण्डे
- भारतीय संस्कृति के आधार - विद्यानिवास मिश्रा
- रामायण की कहानियाँ - हर्षा शर्मा

- रस छंद और अलंकार - कृष्णदेव शर्मा और सुरेश अग्रवाल

B18PS4013	Language-II: Additional English	L	T	P	C
Duration: 14 Weeks		**2**	**1**	**0**	**3**

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

Course Objectives:

1. To ensure the development of the linguistic prowess of the students
2. To motivate the students to appreciate literature
3. To help students build strong language fundamentals
4. To promote an appreciable reading habit among the students

Course Outcomes:

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

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS4013	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

Course Contents:

UNIT – I   **12 Hrs**

John W. May – Narcissus; W.B. Yeats – The Second Coming; Devdutt Pattanaik - *Shikhandi and the Other Stories They Don't Tell you* (Extracts); Iravati Karve – *Yuganta* (Extract)

UNIT – II   **12 Hrs**

Nissim Ezekiel – Night of the Scorpion; Langston Hughes – Mother to Son; Vijay Dan Detha – Double Life; Kate Chopin – The Story of an Hour; Henrik Ibsen – *A Doll's House* (Extract)

UNIT – III   **12 Hrs**

Edgar Allan Poe – The Raven; Bram Stoker – A Dream of Red Hands; Satyajit Ray – Adventures of Feluda (Extract); Stephen King - Gramma

UNIT – IV   **12 Hrs**

The Dalai Lama – The Paradox of Our Times; Kamala Wijeratne – To a Student
Sudha Murthy – In Sahyadri Hills, a Lesson in Humility; Booker T. Washington – Extract from *Up from Slavery* (Chapter 3: The Struggle for Education); 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.
13. Wsahington, Booker T. *Up from Slavery*. Infinity, 2015.

B18PS4020	Communicative English-II	L	T	P	C
Duration:14 Weeks		2	1	0	3

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

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Course Objectives:

1. To attune young minds to concerns and issues which have a broad and wide scope of use and application to life
2. To acquire a functional use of language in context
3. To equip students to deliver formal and informal oral presentations to a variety of audiences in multiple contexts
4. To enable students to construct effective written message in various formats and styles
5. To inculcate the habit of reading and writing leading to effective and efficient communication

Course Outcomes:

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

1. Demonstrate ethical and political responsibilities in taking cognizance of issues relating to society, environment and media
2. Develop a process-oriented approach to writing
3. Make use of grammatical skills developed during the course aptly
4. Utilize the target language effectively to focus on interpersonal skills and develop a good Command over the language

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS4020	**CO1**					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

Course Contents:

Unit-I: Language Acquisition 12 Hrs
Remedial Grammar: Questions & Negatives; Questions Tags, Writing Skills:
Email Writing, Activities: Group Discussions, Literature: Alphonse Daudet - The Last Lesson
Unit-2 : Pursuasive Skills 12 Hrs
Remedial Grammar: Past Simple & Past Perfect, Writing Skills: Report Writing Activities:
Book & Movie Reviews, Literature: Lord Alfred Tennyson - Ulysses
Unit-III: Cognitive Skills 12 Hrs
Remedial Grammar: Present & Past Passive; Conditionals, Writing Skills: Creative Writing
Activities: Role Plays, Literature: O. Henry – The Gift of the Magi

Unit-IV: Employability Skills   **12 Hrs**

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

References:

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.

B18PS4030	Electricity and Magnetism	L	T	P	C
Duration:14 Weeks		**2**	**1**	**0**	**3**

B19PS4030 Prerequisites:

Basics of electricity and magnetism

Course Objectives:

The objectives of this course are to:

1. Describe how static electricity is produced and list examples where its effects are observed.
2. Explain electrostatic induction and polarization.
3. Describe how magnetism is produced and list examples where its effects are observed.
4. Identify the connection between electricity and magnetism.
5. Understand how to do vector calculations including: vector addition, cross products, dot (scalar) products
6. Develop understanding the concepts in electricity and magnetism
7. Reinforce the conceptual understanding and general problem solving skills.

Course Outcomes:

On 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

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS4030	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 Contents:

UNIT-I   **12 hrs**
Electrostatics: Mechanical force and electric pressure on a charged surface. The path traced by a charged particle in uniform electric field. The attracted disc electrometer-construction, theory and applications.
Electrical measurement: C.R.O: construction & working, Measurement of voltage and frequency using a C.R.O.
Galvanometers: Moving coil ballistic galvanometer-construction, theory and derivation, damping correction, current and charge sensitivity, Helmholtz galvanometer – Theory.

UNIT-II   **12 hrs**
Alternating current: R.M.S. values. Response of LR, CR and LCR circuits to sinusoidal voltages (discussion using the complex analysis). Series and parallel resonance-half-power frequency, band-width and Q-factor. Power in electrical circuits- power factor.
Filters: High-pass and low-pass filters with LR and CR combinations. Expression for cut-off frequency. Band pass filters.

UNIT-III   **12 hrs**
Inductance and Thermo-electricity: Anderson's bridge; Mutual inductance; Calculation of the mutual inductance of a pair of coils; the thermocouple, Seebeck, Peltier and Thomson effects. Thermodynamic theory of thermoelectric effect. The law of intermediate metals and the law of intermediate temperatures.   Applications - Calculation of the self-inductance of a solenoid.

UNIT-IV   **12 hrs**
Electromagnetism: Scalar and vector fields; the gradient of a scalar field; the divergence and curl of a vector field. The physical significance of gradient. The divergence and curl, Statement of

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theorems of Gauss and Stokes. Concept of dipole. Ampere's circuital law. Current loop as a dipole. The torque on a dipole. Maxwell's field equations (Quantative). Wave equation for the field vectors. Poynting vector (no derivation). Plane electromagnetic waves–Helmholtz equation, Transverse nature, intrinsic impedance, and wave equation for dielectric.

Books Recommended:

1. Halliday/Resnick/Walker: Fundamentals of Physics, 8th edition, John Wiley & Sons(Asia) Pte. Ltd.
2. K. K. Tewari: Electricity and magnetism, Reprint 2007, S.Chand Co. Ltd., New Delhi.
3. B. B. Laud: Electrodynamics , Wiley Eastern Limited, New Delhi.
4. David. J. Griffiths: Introduction to Electrodynamics, 3rd edition, Prentice-Hall of India Private limited, New Delhi.
5. W.H. Hayt and J. A. Buck: Engineering Electromagnetism , 6th edition, Tata Mc Graw Hill, New Delhi.
6. V.K.Mehta & Rohit Mehta: Principles of Electronics, 11th edition, S.Chand & Co. Ltd., New Delhi.
7. BrijLal and N.Subrahmanyam : A text book of Electricity and Magnetism, 19th edition- Ratan Prakashan Mandir, Educational and University Publishers, Agra.
8. A.B. Bhattacharya, R. Bhattacharya, Under Graduate Physics, Volume II, New Central Book Agency(P) Ltd., Kolkata.
9. D.N. Vasudeva: Fundamentals of Magnetism and Electricity, 12th edition- S. Chand and Co. Ltd., New Delhi.

B18PS4040	Mathematics-IV	L	T	P	C
Duration :14Wks		2	1	0	3

Prerequisites:

Differentiation, integration, basic concepts of arithmetic and algebra.

Course Objectives:

1. To familiarize with the concept of differential calculus.
2. To understand the concept of sequences.
3. To understand the concept of series of real numbers.
4. To familiarize withvector calculus.

Course Outcomes:

1. Apply the concept of limits, continuity, and differentiability of a function at a point.
2. Discuss the different types of sequences.
3. Discuss the nature of series of real numbers.
4. Apply the knowledge of vector calculus.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/Cos	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS4040	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 Contents:

Unit-I: Differential Calculus – 4   12 Hrs

Limits and continuity, L- Hospital rule, Rolle'sTheorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, Taylor's Theorem, Maclaurin's series.

Unit-II: Sequences of Real Numbers   12 Hrs

Definition of a sequences-Bounded sequences- limit of sequences- convergent, divergent and oscillatory sequences- Monotonic sequences and their properties- Cauchy's criterion.

Unit-III: Series of Real Numbers   12 Hrs

Definition of convergence, divergence and oscillation of series -properties of Convergence series - properties of series of positive terms – Geometric series Tests for convergence of series -p-series - comparison of series Cauchy's root Test -D Alembert's test. Raabe'stest, Absolute and conditional convergence-D' Alembert test for absolute convergence - Alternating series - Leibnitz test. Summation of binomial, exponential and logarithmic series.

Unit-IV: Vector Calculus –1   12 Hrs

Velocity, Acceleration, Angle between two vectors, Tangential normal vector, Gradient, Divergence of a scalar point function and curl of a vector point function directional derivative, unit normal to a surface, Solenoidal and irrational vectors – physical interpretation of divergence and curl of a vector point function.

Text Books:

1) Shanthi Narayan and P.K. Mittal, Differential Calculus, Reprint. New Delhi: S. Chand & Company Ltd., 2011

2) G K Ranganath, Textbook of B.Sc. Mathematics, Revised ed., New Delhi, India: S Chand and Company Ltd., 2011.

Reference Books:

1) S Narayanan &ManicavachogamPillay, Vector Algebra and Analysis, 4th ed.: S V Publishers, 1986.

2) RaisinghaniaMd, SaxenaHc, and DassHk, Simplified course in Vector Calculus, 1st ed. New Delhi, India: S.Chand and Company Ltd., 2002.

3) Maurice D. Weir, Joel Hass and Frank R. Giordano, Thomas calculus, 11th Edition, Pearson Publications, 2008

B18PS4040	Statistical Inference-II	L	T	P	C
Duration:14 Wks		2	1	0	3

Prerequisites:

Knowledge of basics statistics-I & II, basics mathematics, differentiation, integration and basics statistical inference-I.

Course Objectives:

1. To allocate and explore the tests of hypotheses for the experimental data.
2. To classify and infer the various tests of significance.
3. To figure out the different nonparametric tests.

Course Outcomes:

The student will be able to
1. Infer the experimental data analysis using the tests of hypotheses.
2. Discriminate the various applications of tests of significance.
3. Investigate the data using nonparametric tests.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS4040	CO1	2	3	2	2	1	2	1	1	3	2
	CO2	2	2	2	2	1	2	1	1	2	2
	CO3	2	3	2	2	1	2	1	1	2	2

Course Contents:

Unit-1: Introduction to tests of hypotheses **[12 Hrs]**

Statistical hypotheses- null and alternative, simple and composite hypotheses. Type-I and Type- II errors, test functions. Randomized and nonrandomized tests. Size, level of significance, power function, power of tests. Critical region. p-value and its interpretation. Illustrative examples. Most powerful (MP) test. Statement of Neyman – Pearson lemma and its applications.

Unit-2: Tests of significance-I **[12 Hrs]**

Large and small sample tests of significance. Tests for single mean, equality of two means, single variance, and equality of two variances for normal populations Tests for proportions.

Unit-3: **Tests of significance II** **[12 Hrs]**

Tests for simple, partial, and multiple correlation coefficients and regression coefficients. Fisher's Z-transformation and its applications. Analysis of categorical data: contingency tables, tests for the independence and association of attributes. Chi-square tests for independence of attributes and goodness of fit.

Unit-4: **Nonparametric tests** **[12 Hrs]**

Introduction to nonparametric tests. Run test for randomness. Sign test and Wilcoxonsigned rank test for one and paired samples. Run test, median test, and Mann-Whitney-Wilcoxon test for two sample problems. Test for independence based on Spearman's rank correlation coefficient.

Text books:
1.   Walpole, R.E., Myers, R.H., and Myers, S.L. (2017). *Probability and Statistics for Engineers andScientists,* 9/e, Pearson, New Delhi.
2.   Mukhopadhyay, P.(2015): *Mathematical Statistics,* Books and Allied (P) Ltd., Kolkata.

3.   Montgomery, D.C. and Runger, G.C. (2013). *Applied Statistics and Probability for Engineers,* Wiley India, New Delhi

4.   Chandra,T. K. and Chatterjee, D. (2005). *A First Course in Probability*, Narosa Publishing House, New Delhi..

5.   Lehmann, E. L. and Romano, J. P. (2005). *Testing Statistical Hypotheses,* 2/e, John Wiley, NewYork.

6.   Hogg, R. V. and Craig, A.T. (1995).*Introduction to Mathematical Statistics,* 5/e, Prentice Hall, New Jersey, USA.

Reference Books:

1.   M.L Berenson, D.M Levine, and T.C Krehbiel, Basic Business Statistics- concepts and applications, 12th Edn, Pearson Education, 2011.

2.   Rohatgi, V.K. and Saleh, A.K. Md. E. (2002). An Introduction to Probability Theory andMathematical Statistics, 2/e, John Wiley, New York.

3.   Bhattacharya, G. K. and Johnson, R.A. (1986): Statistical Concepts and Methods, John Wiley, New York.

4.   Dudewicz, E.J. and Mishra, S.N.(1980). Modern Mathematical Statistics, John Wiley, New York.

B18PS4070	**Physics Lab - IV**	L	T	P	C
Duration:14 Wks		0	0	2	2

Prerequisites:

This is a laboratory course which covers experiments related to simple harmonic motion waves, basic theory of light and optical phenomenon like diffraction, interference and polarization.

Course Objectives:

The objectives of this course are 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

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2
B18PS4070	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 Contents:

Any **Eight** of the Following Experiments

1. Anderson's Bridge – Determination of the self-inductance of the coil.

2. de-Sauty bridge – Verification of laws of combination of capacitances.

3. High resistance by leakage using BG or relevant method

4. BH using Helmholtz double coil galvanometer and potentiometer.

5. Capacity of a condenser using a BG.

6. LCR series circuit – Determination of L & Q factor.

7. Voltage triangle – Measurement of phase difference.

8. Low and High pass filters – Determination of the cut-off frequency.

9. LCR parallel circuit – Determination of L & Q factor.

10. To study the variation of X_C with f and determination of C.

11. Black box – Identification of L, C& R.

12. CRO – determination of voltage and frequency.

13. Determine the magnetic field at the center of the Solenoid.

14. Determine the Hall voltage.

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Text books:

5. Thiruvadigal, J. D., Ponnusamy, S.Sudha.D. and Krishnamohan M., "Physics for Technologists", Vibrant Publication, Chennai, 2013

6. R.K.Shukla and Anchal Srivastava, "Practical Physics", 1st Edition, New Age International (P) Ltd, New Delhi, 2006.

Reference Books:

9. G.L.Souires, "Practical Physics:", 4th Edition, Cambridge University, UK, 2001.

10. D. Chattopadhyay, P. C. Rakshit and B. Saha, "An Advanced Course in Practical Physics", 2nd ed., Books & Allied Ltd., Calcutta, 1990.

11. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)

12. Practical Physics – S. L. Gupta &V. Kumar (PragatiPrakashan).

B18PS4080		L	T	P	C
Duration:14 Wks	Mathematics Lab-IV	**0**	**0**	**2**	**2**

Prerequisites:

Differentiation, integration, basic concepts of arithmetic and algebra.

Course Objectives:

1. Acquire skill in solving problems on differential calculus using SCILAB/MAXIMA.
2. Gain proficiency in using MAXIMA to solve problems of Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, and Taylor's Theorem.
3. Acquire proficiency in using MAXIMA to solve the concept of sequence and series of real numbers
4. Obtain skill in creating programs on vector calculus using *Scilab* and *Maxima*.

Course Outcomes:

1. Exhibit proficiency in using Maxima to study differential calculus.
2. Obtain knowledge in differential calculus and to sketch the graph for solutions.
3. Demonstrate the use of Maxima to understand and interpret the core concepts in sequences and series.

Mapping of Course Outcomes with programme Outcomes

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

B18PS4080	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

Course Contents:

1. To verify continuity of a function
2. Evaluation of limits by L hospital's rule
3. To verify Rolle's theorem for a given function
4. To verify Lagrange's mean values theorem for a given function
5. To verify Cauchy's mean values theorem for a given function
6. To verify Taylor's theorem for a given function
7. To verify whether given sequence is convergent divergent and oscillatory

B18PS4080	Statistical Inference Lab-II	L	T	P	C
Duration:14 Wks		0	0	2	2

Prerequisites:

Knowledge of basics statistics-I & II, basics mathematics, differentiation, integration and basics statistical inference-I.

Course Objectives:

1. To allocate and explore the tests of hypotheses for the experimental data.
2. To classify and infer the various tests of significance.
3. To figure out the different nonparametric tests

Course Outcomes:

The student will be able to
1. Infer the experimental data analysis using the tests of hypotheses.
2. Discriminate the various applications of tests of significance.
3. Investigate the data using nonparametric tests

Mapping of Course Outcomes with programme Outcomes

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

Lab Experiments

(Demonstration of practicals using MS-Excel)

1. Evaluation of probabilities of Type-I and Type-II errors and powers of tests.
2. MP test for parameters of binomial and Poisson distributions.
3. MP test for the mean of a normal distribution and power curve.
4. Tests for mean, equality of means when variance is (i) known, (ii) unknown under normality (small and large samples)
5. Tests for single proportion and equality of two proportions.
6. Tests for variance and equality of two variances under normality
7. Tests for correlation and regression coefficients.
8. Tests for the independence of attributes, analysis of categorical data and tests for the goodness of fit.(For uniform, binomial and Poisson distributions)
9. Nonparametric test I(Test for randomness, sign tests)
10. Nonparametric test II(Two sample tests)

Text books:

7. Walpole, R.E., Myers, R.H., and Myers, S.L. (2017). *Probability and Statistics for Engineers andScientists,* 9/e, Pearson, New Delhi.

8. Mukhopadhyay, P.(2015): *Mathematical Statistics,* Books and Allied (P) Ltd., Kolkata.

9. Montgomery, D.C. and Runger, G.C. (2013). *Applied Statistics and Probability for Engineers,* Wiley India, New Delhi

10. Chandra,T. K. and Chatterjee, D. (2005). *A First Course in Probability*, Narosa Publishing House, New Delhi..

11. Lehmann, E. L. and Romano, J. P. (2005). *Testing Statistical Hypotheses,* 2/e, John Wiley, NewYork.

12. Hogg, R. V. and Craig, A.T. (1995).*Introduction to Mathematical Statistics,* 5/e, Prentice Hall, New Jersey, USA.

Reference Books:

5. M.L Berenson, D.M Levine, and T.C Krehbiel, Basic Business Statistics- concepts and applications, 12th Edn, Pearson Education, 2011.
6. Rohatgi, V.K. and Saleh, A.K. Md. E. (2002). An Introduction to Probability Theory andMathematical Statistics, 2/e, John Wiley, New York.
7. Bhattacharya, G. K. and Johnson, R.A. (1986): Statistical Concepts and Methods, John Wiley, New York.
8. Dudewicz, E.J. and Mishra, S.N.(1980). Modern Mathematical Statistics, John Wiley, New York.

Semester: V

B18PS5010	**Quantum Mechanics**	L	T	P	C
Duration :14Wks		2	1	0	3

Prerequisites:

Basic concept s of wave dualism and quantum mechanics.

Course Objectives:

The objectives of this course are to:
1. To have a clear understanding of the principles of quantum mechanics
2. To understand the laws of quantum mechanics
3. To know the application of Schrodinger wave equations and quantum concepts
4. To implement and understand of vector atom model to explain the various models.

Course Outcomes:

On 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. Postulate the basics of quantum mechanics.
3. Apply Schrodinger wave equation for one dimensional problems like, particle in a box, hormonic oscillator etc.
4. Analyse the different atomic models by vector atom model.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS5010	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 Contents:

UNIT-I: Wave Particle Dualism   **9 Hrs**

Introduction, Photoelectric Effect, Quantum Theory of Light, The Compton Effect; Expression, De-Broglie waves, Wave function, de Broglie Wave Velocity, Wave and Group velocities, G. P. Thomson's experiment, The Uncertainty principle and its applications, The Wave Particle Duality, problems.

UNIT-II: SCHRÖDINGER'S Equation: **9 Hrs**

Introduction, Schrödinger's Equation: Time dependent form, Probability current, Expectation Values, Operators, Schrödinger's Equation: Steady-state form, Eigen values and Eigen functions and probability density, Problems.

UNIT-III: Applications of Quantum Mechanics: **9Hrs**

Introduction, The particle in a box: energy quantization, wave functions, momentum Quantization, the Harmonic Oscillator-Energy level, the particle in a three dimensional box quantum dots, tunneling effect; applications, problems.

UNIT-IV: Vector Atom Model: **9 Hrs**

Introduction to atomic models; Rutherford's; Bohr's; Sommerfeld's; vector atom model; Quantization principles; momentum and spin; Quantum numbers –Total quantum number, Orbital quantum number, Magnetic quantum number (qualitatively). Space quantization, Stern-Gerlach experiment, Zeeman effect – theories of normal and anomalous Zeeman effect, Paschen back effect- Qualitative only

Books Recommended:

1. Perspectives of Modern Physics-Arthur Beiser (McGraw-Hill Int.Edition)

2. Modern physics – R. Murugeshan. (S.Chand & Co.XIth Revised edition)

3. Text Book of Quantum mechanics – Kakani & Chandaliya (S.Chand & sons)

4. Quantum Mechanics – Chatwal and Anand (Himalaya Publishing)

5. Quantum Mechanics- Ghatak and Loknatha

6. Ghatak, A, Introduction to Quantum Mechanics, Macmillan India Ltd, 2000

Schiff, L. I., Quantum Mechanics, III Edition, McGraw Hill, 1968

B18PS5020		Mathematics –V		L	T	P	C
Duration:14 Wks				**1**	**1**	**0**	**2**

Prerequisites:

Knowledge of trigonometry, geometry and calculus.

Course Objectives:

1. Learn to evaluate multiple integrals.
2. Learn to evaluate volume and surface integrals.
3. Understand the concepts in vector spaces and Linear Transformations.
4. Gain problems solving skills in solving vector spaces and linear transformations.

Course Outcomes:

1. Apply fundamental theorem to evaluate Area, region and volume of geometrical bodies using Green's theorem, Stoke's theorem or Gauss divergence theorem.
2. Describe and manipulate vector spaces, subspaces and their bases.
3. Determine the kernel, image space and matrix representation of a linear transformation.
4. To become proficient in solving computational problems of linear algebra.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS5020	**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 Contents:

Unit-I: Multiple Integral   **9 Hrs**

Applications of Integral Calculus: Computation of length of arc, plane area and surface area and volume of solids of revolutions for standard curves in Cartesian and Polar forms.

Evaluation of double integrals and triple integrals, Evaluation of double integrals over the given region, by changing the order of integration, by change of variables, Application to area and volume – illustrative examples.

Unit-II: Vector integration 9 Hrs

Line integrals, definition and problems, surface and volume integrals, Green's Theorem, Stoke's and Gauss divergence theorem.

Unit-III: Linear Algebra – 1 9 Hrs

Vector spaces, general properties of vector spaces, vector subspaces, algebra of subspaces, and linear combination of vectors. Linear span, linear sum of two subspaces, linear independence and dependence of vectors, basis of vector space.

Unit-IV: Linear Algebra – 2 9 Hrs

Finite dimensional vector spaces, Dimension of a vector space, Dimension of a subspace. Linear transformations, linear operators, Range and null space of linear transformation, Rank and nullity of linear transformations.

Suggested Text Books:

1. Shanthi Narayan, Integral Calculus, Reprint. New Delhi: S. Chand and Company Ltd., 2004.
2. G K Ranganath, Text book of B.Sc. Mathematics, Revised ed. New Delhi, India: S Chand and Company Ltd., 2011.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 8th edn. New Delhi, India: Wiley India Pvt. Ltd., 2010.
2. S Narayanan & M Pillay, Vector Algebra and Analysis, 4th ed.: SV Publisher, 1986.
3. Raisinghania Md, Saxena Hc, and Dass Hk, Simplified course in Vector Calculus, 1st ed. New Delhi, India: S.Chand and Company Ltd., 2002.

B18PS5030		L	T	P	C
	Mathematics -VI	1	1	0	2
Duration:14 Wks					

Prerequisites:

Knowledge of basics limits, continuity, differentiation, integration, matrices, determinants, and

geometry.

Course Objectives:

1. Use computational tools to solve problems and applications of partial differential equations.
2. Get familiar with the theories on rings, integral domains and fields.
3. Introduce the basic concepts of abstract algebra
4. To understand the concepts of solid geometry and its applications in various fields.

Course Outcomes:

1. Formulation of PDE by eliminating arbitrary constants and functions, solve linear PDEs using Lagrange's auxiliary equation and solve nonlinear PDE's of first order by Charpit'smethod.
2. Familiarize with partial differential equations, and its applications to standard problems like Heat, Wave and Laplace.
3. Explain the fundamental concepts of abstract algebra such as rings, fields and their role in modern mathematics and applied contexts.
4. Apply the concepts of solid geometry and to solve problems of various fields.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS5030	**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 Contents:

Unit-I: Partial Differential Equations – 1   9 Hrs

Formation of Partial Differential Equations by eliminating arbitrary constant and functions, Solution of nonhomogeneous PDE by direct integration, solution of homogeneous PDE involving derivative with respect one independent variable only, solution of Lagrange's linear PDE by the method of separation of variables.

Unit-II: Partial Differential Equations – 2   9 Hrs

Homogeneous linear equations with constant coefficients, Rules for finding complementary function, Rules for finding particular integral, nonhomogeneous linear equations, Non linear equations of the second order.

Unit-III: Rings and integral Domain   9 Hrs
Definition and basic properties, Fields, Integral domains, divisors of zero and Cancellationlaws, Integral domains, The characteristic of a ring, some non – commutative rings,Examples, Matrices over a field, The real quaternions , ,Homomorphism of Rings – Definitionand elementary properties, Maximal and Prime ideals, Prime fields.

Unit-IV: Solid Geometry   9 Hrs
The Plane: Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.
The Line: Equations of a line, Angle between a line and a plane, The condition that a given line may lie in a given plane, The condition that two given lines are coplanar, Number of arbitrary constants in the equations of a straight line. Sets of conditions which determine a line, The shortest distance between two lines. The length and equations of the line of shortest distance between two straight lines, Length of the perpendicular from a given point to a given line, Intersection of three planes, Triangular Prism.

Text Books:
1. M D Raisinghania, Ordinary and Partial Differential Equations, S Chand and Co. Pvt. Ltd., 2014.
2. Shanthi Narayan, Analytical Solid Geometry. New Delhi: S. Chand and Co. Pvt. Ltd., 2004.

Reference Books:
1. John B Fraleigh, A First course in Abstract Algebra, 3rd ed.: Narosa Publishing House., 1990.
2. R. Balakrishan and N.Ramabadran, A Textbook of Modern Algebra, 1st ed. New Delhi, India: Vikas publishing house pvt. Ltd., 1991.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 8th ed.: New Delhi, India: Wiley India Pvt. Ltd., 2010.

B18PS5040	Design and Analysis of Experiments	L	T	P	C
Duration:14 Wks		1	1	0	2

Knowledge of basics statistics-I & II, basics mathematics, differentiation, and basics statistical inference-I & II.

Course Objectives:

1. To equip the students with the basic concepts, theory and applications of ANOVA technique.
2. To guide the students to understand the concepts, issues and principles of design of experiments.
3. To construct a good designs for different practical experiments.
4. To describe the statistical analysis of experimental data.

Course Outcomes:

Upon completion of the course, students will be able to
1. Explore the basic theory of ANOVA technique and apply it to real-life data.
2. Understand the basic concepts and principles of experimental design.
3. Construct optimal or good designs for a range of practical experiments
4. Describe how the analysis of data pertaining to different experimental designs can be carried out.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS5040	CO1	2	3	3	3	2	2	2	1	3	3
	CO2	2	3	2	3	1	2	2	1	3	2
	CO3	2	3	2	3	1	2	1	1	3	3
	CO4	2	3	2	3	1	2	1	1	2	3

Course Contents:

Unit-1: Analysis of variance **[9 hrs]**

Meaning and assumptions. Fixed, random and mixed effect models. Analysis of variance of one-way and two-way classified data with and without interaction effects. Multiple comparison tests: Tukey's method, critical difference.

Unit-2: Experimental designs   [9 hrs]
Terminology in experimental designs, Principles of design of experiments. Completely randomized, randomized block, and Latin square designs (CRD, RBD, and LSD) -layout formation and statistical analysis using fixed effect models.

Unit-3: Relative efficiency and Missing plot technique   [9 hrs]
 Comparison of efficiencies of CRD, RBD, and LSD Estimation of single and two missing observation in RBD and LSD and analysis.

Unit-4: Factorial experiments   [9 hrs]
 Basic concepts, main effects, interactions, and orthogonal contrasts in 2^2 and 2^3 factorial experiments. Yates' method of computing factorial effects total. Analysis and testing the significance of effects in 2^2 and 2^3 factorial experiments in RBD. Confounding-Need for confounding. Complete and partial confounding in a 2^3 factorial experiment in RBD layout and its analysis.

Text books:
1. Montgomery, D.C. (2014). *Design and Analysis of Experiments*, Wiley. New York.
2. Goon A.M., Gupta, M.K., Das Gupta, B. (1991).*Fundamentals of Statistics*,Vol.I, World Press, Calcutta.
3. Joshi, D. D. (1987).*Linear Estimation and Design of Experiments*, New Age International (P) Limited, New Delhi.

Reference Books:
1.   Mukhopadhya, P.(2015): *Mathematical Statistics,* Books and Allied (P) Ltd., Kolkata.
2.   Cochran, W.G. and Cox, G. M. (1992).*Experimental Designs*, John Wiley and Sons, New York.

B18PS5061	Renewable Energy Resource	L	T	P	C
Duration :14Wks		2	0	0	2

Basic concept s of energy and its applications.

Course Objectives:

The objectives of this course are to:
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 explain the concept of various forms of renewable energy
4. To outline division aspects and utilization of renewable energy sources for both domestics and industrial application
5. To analyse the environmental aspects of renewable energy resources.

Course Outcomes:

On 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.
5. Summarize the various photovoltaic systems.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS5061	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 Contents:

UNIT I: Sources of Renewable Energy   **6 Hrs**

Solar, wind, Biomass availability, merits and demerits. Hydrogen as a source. Various forms of energy, Types of energy reservoirs, photo-thermal and photovoltaic systems, geothermal systems, wind energy

Solar cooker, Solar dryer, solar hot water systems- Principles, Working and its applications.

Solar lantern, Water Pumps and Street lights- Principles, Working and its applications.

UNIT–II: SOLAR Energy & its Utilization   6 Hrs

SOLAR Energy & its utilization: Origin of Solar Energy, 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 Principle of conversion of solar energy into heat.

UNITS–III: Energy Storage & Fuel Cells: 6 Hrs

Sensible heat storage liquids and solids, latent heat storage, thermo chemical storage, storage through charged batteries and its applications, Classification of solar collectors, Flat plate and concentrating collectors, construction, Thermal efficiency and coating, Heat losses, Solar cell and its efficiency, P.V. Panels.

Design and Principle of operation, Classification, Types, Advantages and disadvantages, Conversion efficiency, Types of electrodes, Work output and EMF of Fuel Cells, Applications of Fuel Cells.

UNIT–IV: Wind Energy & Ocean Energy   6 Hrs

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, Types of wind driven Machine Horizontal and vertical axis types and applications.

Energy from Sea waves, Ocean Thermal energy- temperature gradient in sea and their use for power generation and its applications.

Books Recommended:

1. J.T. MacMillan, R. Morgan & R.B.Murray: Energy Resources, 2nd edition, 2002.
2. S.P.Sukhatme: Solar Energy Principles & Thermal Collection & Storage, 2nd edn, TMH, New Delhi 2010.
3. G.D.Rai: Solar Energy Utilization, 5th edition, Khanna Publishers, New Delhi 2012.
4. G.D.Rai: Non-Conventional Energy sources, 4th edition, New Delhi 2010.
5. E.W.Golding: The Generation of Electricity (by wind) Prentice hall, New York 2007

B18PS5062	Solid State Physics	L	T	P	C
Duration:14 Weeks		2	0	0	2

Prerequisites:

Fundamentals of solid state Physics

Course Objectives:

The objectives of this course are to:

1. To provide basic knowledge of the types of solids and their structure
2. To understand how structure effects different properties of the solids.
3. To impart the knowledge of different phenomenon's taking place in the solids.
4. To give the insight of different applications with the solids.

Course Outcomes:

On completion of this course the student will be able to:
1. Discuss the concepts of crystal structure.
2. Classify the solids based on their structure details.
3. Analyze the behavior of solids under different conditions like heat, optical and electrical treatments.
4. Compare the different models or theories.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS5062	CO1	3	2	2	2	2				3	1
	CO2	3	3	2	2	1				3	2
	CO3	3	3	2	2	1				3	1
	CO4	3	3	2	2	1				3	1

Course Contents:

UNIT -I: **6 Hrs**
Statistical physics: The Maxwell-Boltzmann. Bose-Einstein and Fermi-Dirac energy distribution formulae (no derivation). A qualitative comparison of the three distribution formulae.
Bonding in crystals: Inter atomic forces and types of Bond in a crystal, properties and characteristics of -Ionic bond, covalent bond, Metallic bond, Molecular bond and Hydrogen bond.
UNIT -II: **6 Hrs**
Thermal properties of solids: Dulong and Petit's law and its limitations. Einstein's theory of specific heat. Debye's theory of specific heat.
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. Weidman-Franz law, Density of states. Expression for the Fermi energy, Hall effect and magneto resistance in metals. Expression for Hall co-efficient in metals.
UNIT -III: **6 Hrs**

Dielectric properties: Dielectric materials and its properties, Methods of determining dielectric constant for solids and liquids.

Superconductivity: Elementary ideas and experimental facts. Meissner's effect. Magnetic properties of type-I and type-II superconductors, Critical magnetic field. Influence of external agents on superconductivity, Cooper pairs, BCS theory (qualitative), Applications of superconductivity. Introduction to high-temperature superconductors.

UNIT -IV: **6 Hrs**

X-rays: Bragg's law and the Bragg spectrometer. A brief mention of the different types of crystals. Miller indices, structure of NaCl and CsCl crystals. Continuous x-ray spectra, Duane and Hunt limit. Characteristic x-ray spectra. Mosley law and its significance. Compton effect- expression for Compton shift.

Lasers: General principles. Three level laser-action The He-Ne laser- construction and working, Applications of Laser - Laser Cooling, Material Processing (Lasers in Welding, Drilling, and Cutting), Medicine, Laser-induced Fusion, Laser Soldering, scribing, Laser Heat Treatment, LIDAR

Reference Books:

1. Hugh D. Young, Roger A Freedman and A.Lewis Ford: University Physics 13th edition
2. Arthur Beiser: Concepts of modern physics,6th edition, TMH, New Delhi.2008.
3. J.B. Blackmore: Introduction to solid state physics 2nd Edition reprint, Press Syndicate of the University of the Cambridge, United Kingdom, 1998
4. M A Wahab , solid state physics 2nd Edition , Narosa Publishing House, New delhi.2009.
5. A. J. Dekkar : Solid State physics ,MACMILLAN & CO LTD , Reprint, 1967
6. MN Avadhanulu, An Introductions to LASERS-Theory & Applications, S Chand & Co,
7. A.K. Saxwna, Atomic and Molecular Spectra and Lasers, 1st Edition, CBS Publishers and Distributors 2009
8. B B Laud, Lasers and Non-linear optics,2nd Edition, New age International, New Delhi.2004
9. B S Saxsena, R C Guptha and P N Saxsena, Fundamentals of Solid State Physics, 17th edition, Pragathiprakashana,Meerut 2000.

B18PS5063	**Semiconductor Physics**	L	T	P	C
Duration:14 Weeks		2	0	0	2

Prerequisites:

Fundamentals of semiconducting devices.

Course Objectives:

The objectives of this course are to:

1. To explain the underlying physics of semiconductor materials.

2. To explore the internal behaviour of semiconductor devices.

Course Outcomes:

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

1. Derive expressions for conductivity and energy gap in semiconductors.

2. Explain Fermi level, carrier concentration and hall effect.

3. Explain the working of semiconductor devices like Zener diode, transistor, FET

4. Explain the working of optoelectronic devices like Solar cells, Photodiode, LED.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2
B18PS5063	CO1	3	2	2	2	1				3	1
	CO2	3	3	2	2	1				3	2
	CO3	3	3	2	2	1				3	1
	CO4	3	3	2	2	1				3	1

Course content:

UNIT I: Band theory: **6 Hrs**

Concept of bands in solids, intrinsic and extrinsic semiconductor. 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 & hole mobilities, effective mass, Expression for the energy gap.

UNIT–II: Effect of temperature and doping: **6 Hrs**

Variation of conductivity with temperature Fermi level, Expression for Fermi level in extrinsic semiconductors- both P and N type. Diffusion current and total current, Life time of charge carriers, Variation of Fermi level with temperature and impurity concentration.

UNIT–III: Semiconductor Devices: **6 Hrs**

I-V Characteristics of diode, Zener diode, Transistor, working of transistor in CB, CC and CE configuration mode, Photo diode working and its applications.

UNIT–IV: Applications of Semiconductor Devices: **6 Hrs**

Phenomena of Photo conductivity expression for Photo emf of P-N junction, Photo voltaic cells, LED and FET construction, working and its applications.

Books Recommended:

1. R K Puri and V K Babbar, Solid State Physics and Electronics, S Chand & Co, New Delhi 1997.

2. B S Saxsena, R C Guptha and P N Saxsena, Fundamentals of Solid State Physics, 17th edition, P Prakashana, Meerut 2000.

B18PS5071	Complex Analysis	L	T	P	C
Duration:14 Wks		**2**	**0**	**0**	**2**

Prerequisites:

Knowledge of Linear Algebra, Differential Equation and Real Analysis

Course Objectives:

This course concerns the complex analysis and applications of line integrals, Cauchy's inequality and Residue theorem.

Course Outcomes:

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

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO 2
B18PS5071	**CO1**	3	2	2	2	1				3	1
	CO2	3	3	2	2	1				3	2
	CO3	3	3	2	2	1				3	1
	CO4	3	3	2	2	1				3	1

Course Contents:

Unit-I: Complex Analysis – 1   **6 Hrs**

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

Unit-II: Complex Analysis – 2   **6 Hrs**

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   **6 Hrs**

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 theorem (statement) and itsconsequences.Cauchy's integral formulae for the function and derivatives (statement). Applications to the evaluation of simple line integrals. Cauchy's inequality. Liouville's theorem-Fundamental theorem of algebra.

Unit-IV: Complex analysis – 4   **6 Hrs**

Power series expansion of an analytic function, Taylor's theorem (statement) and series, Laurent's theorem (statement) and series. Singularity and residue, formula for the residue at a pole and Cauchy's Residue theorem (statement) -Simple problems.

Text Books/open source materials

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.

Suggested Web links:

1. http://www.math.unl.edu/~webnotes/contents/chapters.htm
2. http://www-groups.mcs.st-andrews.ac.uk/~john/analysis/index.html
3. http://web01.shu.edu/projects/reals/index.html
4. http://www.mathcs.org/analysis/reals/index.html

B18PS5072	Fluid Dynamics	L	T	P	C
Duration:14 Wks		**2**	**0**	**0**	**2**

Prerequisites:

Knowledge of Calculus and intermediate Physics

Course Objectives:

1. Explain the relative angular velocity, acceleration, rectilinear motion, work, power and energy.
2. State projectile, trajectory and inclined plane.
3. Explain conservation of linear momentum, impact of the sphere.
4. State central force and orbit, Kepler's laws on planetary motion, moment of inertia of simple bodies.

Course Outcomes:

1. Apply relative angular velocity, acceleration and solve problems on work, power and energy.
2. Analyze projectile, trajectory and solve problems on it.
3. Apply conservation of linear momentum, analyze the impact of spheres and solve problems on it.
4. Apply Kepler's laws on planetary motions and analyze the moment of inertia of different geometrical objects.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS5072	**CO1**	3	3	3	2	1			1	3	3
	CO2	3	3	2	2	1			1	3	2
	CO3	3	2	1	2	1			1	3	2
	CO4	3	2	2	2	2			2	3	2

Course Contents:

Unit-I   **06 Hrs**

Velocity, relative velocity, angular velocity, aceleration, rectilinear motion, rectilinear motion with constant acceleration, relative angular velocity, work, power, energy.

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Unit-II   **06 Hrs**

Motion of a projectile, nature of a trajectory, results pertaining to the motion of a projectile, range on an inclined plane, maximum range on the inclined plane. Simple problem

Unit-III   **06 Hrs**

Impulsive force, conservation of linear momentum, impact of a sphere, laws of impact, impact of two smooth spheres, direct impact of two smooth spheres, direct impact of a smooth sphere on a plane, oblique impact of a smooth sphere on a plane. Simple problems.

Unit-IV   **06 Hrs**

Central force and central orbit, equation of central orbit, finding law of force and speed for a given orbit, determination of the orbit when law of force is given, Kepler's Laws on planetary motion. Simple problems. Moment of inertia of simple bodies, Theorems of parallel and perpendicular axes, moment of inertia of triangular lamina, circular lamina, circular ring, right circular cone, sphere. Simple problems.

Text Books:
1. An Introduction to Fluid dynamics by G K Batcher, Cambridge University Press.
2. Elementary Fluid Dynamics by D J Acheson, Clarendon Press.

Reference Books:
1. Fluid Dynamics an introduction by Rieutord, Michel, Springer Publications.
2. Physical Fluid Dynamics by D J Tritton.
3. A First Course in Fluid Dynamics by A R Paterson, Cambridge University Press.

B18PS5073	Number Theory	L	T	P	C
Duration:14 Wks		**2**	**0**	**0**	**2**

Prerequisites:

Knowledge of Abstract Algebra and Commutative Algebra

Course Objectives:

1. To understand the theory of congruence's.
2. To understand the functions of several variables.
3. To familiarize with graphs.

4. To familiarize with the concept of limits and continuity in higher dimensions.

Course Outcomes:

1. Discuss the theory of congruence's.
2. Discuss functions of several variables.
3. Produce and interpret graphs of functions of 2 and 3 variables.
4. Demonstrate limits and continuity in higher dimensions.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS5073	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 Contents:

Unit-I   06 Hrs

The theory of congruence's, properties of congruence's, binary and decimal representation of integers, linear congruence's and the chinese remainder theorem. Fermatas Theorem, Wilson's Theorem, Euler's Phi-Function, Euler's Theorem, Some properties of Phi-Function, Finite continued fractions.

Unit-II   06 Hrs

Functions of several variables: Definition of function of n independent variables, domains and ranges, functions of two variables, definition of interior and boundary points, definitions of open, closed, bounded and unbounded regions in a plane.

Unit-III   06 Hrs

Graphs, level curves, and contours of functions of two variables, level curves, graph, surface, functions of three variables, level surface, interior and boundary points for space regions, open and closed regions.

Unit-IV   06 Hrs

Limits and continuity in higher dimensions: Limits and continuity. Two path test for non-existence of limit, continuity of composites, functions of more than two variables, extreme values of continuous functions on closed and bounded sets.

Text Books:

1. Thomas calculus, by Maurice D. Weir, Joel Hass and Frank R. Giordano, 11th Edition, Pearson Publications, 2008.
2. Elementary Number theory by David M Burton, 6th Edition-Tata McGraw Hill

Reference Book:

Number Theory by H.S. Hall, S.R. Knight, Maxford Books, 2008.

B18PS5081	Statistical Quality Control(SQC)	L	T	P	C
Duration:14 Wks		**1**	**1**	**0**	**2**

Prerequisites:

Knowledge of summarizing and descriptive statistics, plotting graph.

Course Objectives:

1. To learn the basic concepts of Statistical Quality Control and it's need.
2. To familiarize with techniques and approach of SQC being used in industry to manufacture goods and services of high quality at low cost.

Course Outcomes:

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

1. Understand the basic concepts of Statistical Quality Control and it's need
2. Understand the Statistical process control tools- Control charts for variables and attributes.
3. Understand the Statistical product control tools- Sampling inspection plans.
4. Apply the knowledge of various tools and techniques of SQC in real life.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS5081	**CO1**	2	3	3	2			1		3	

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

Course Contents:

Unit-1 [6 hrs]

Basics of SQC: Introduction to statistical quality control (SQC), aims and objectives. Chance and assignable causes of variation. Process control and product control. Control charts and basis for their construction. Action and warning limits. Various tools of SQC. Rational subgroups.

Unit 2 [6 hrs]

Control charts for variables: Derivation of control limits, basis, construction and interpretation of mean, range and standard deviation charts. Criteria for detecting lack of control.

Unit 3 [6 hrs]

Control charts for attributes: np-chart, p-chart, stabilized p-chart, c-chart and u-chart. Criteria for detecting lack of control.

Unit 4 [6 hrs]

Product control: Lot acceptance sampling- Sampling inspection, 100 percent inspection and rectifying inspection. AQL, LTPD, Producer's risk and consumer's risk. Acceptance sampling plans – single and double sampling plans by attributes- Derivation of OC, AOQ, ASN, and ATI, functions.

Text Books:

1. Goon A.M., Gupta, M.K., Das Gupta, B. (1991).*Fundamentals of Statistics*,Vol.I, World Press, Calcutta.
2. Grant, E.L. and Leavenworth, R. S. (1996). *Statistical Quality Control*. 7th edition, McGrawHill, New York.
3. Mahajan, M. (2001).*Statistical Quality Control*, Dhanpat Rai & Co. (P) Ltd. New Delhi.
4. Montgomery, D.C. (2013). *Introduction to Statistical Quality Control*, (Wiley Int. Edn.)

References:
1. John, S.O. and Followell, R. F. (1990). Statistical Process Control. (East West Press, India.

2. Mukhopadhyay, P (1996). Applied Statistics. Calcutta Publishing House.

3. Mukhopadhyay, P. (2015): *Mathematical Statistics,* Books and Allied (P) Ltd., Kolkata.

Semester 5:

B18PS5082	Reliability and Survival Analysis	L	T	P	C
Duration:14 Wks		1	1	0	2

Prerequisites:

Knowledge of descriptive statistics, basics of probability, probability distributions and inferential statistics.

Course Objectives:

1. To make to students to understand the basic concepts of reliability theory.
2. To learn to evaluate system reliability for series, parallel, k out of n systems
3. To learn to handle censored data, techniques and tools to obtain survival probability.
4. To get an idea of important lifetime distributions such as exponential and gamma distributions

Course Outcomes:

Upon completion of the course, students will be able to:
1. Demonstrate the fundamental concepts reliability theory.
2. Understand the fundamental concepts of survival functions and their relationship.
3. Handle censored data and estimating mean survival time.
4. Model various lifetime distributions for the real life data.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS5082	CO1	2	3	3	2			1	2	3	
	CO2	3	3	2	3			1	2	3	1
	CO3	2	3	2	3			1	2	3	3
	CO4	2	3	2	3			1	2	2	3

Course Contents:

Unit 1 [6hrs]
Reliability: Reliability concepts and measures, components & systems, coherent systems, reliability of coherent systems- Series, parallel and k-out-of- n systems.

Unit 2 [6hrs]
Survival analysis: Survival functions, hazard rate, cumulative hazard function, residual life time, survival function of residual life time, mean residual life time, one-one correspondence of these functions. Computation of these functions for Common life time distributions: exponential and gamma.

Unit 3 [6hrs]
Notions of aging: IFR, IFRA, NBU, DMRL, NBUE, and HNBUE classes; their duals. Aging properties of common life time distributions.

Unit 4 [6hrs]
Censoring: Concept of censoring, various types of censoring, Estimation and Testing of parameters of exponential distribution under various types of censoring.

Text Books:
1. Barlow R.E. and Proschan F. (1975): Statistcal Theory of Relibilty & Life Testing, Holt, Reinhart and Winston.
2. Cox, D.R. and Oakes, D. (1984).Analysis of Survival Data,Chapman and Hall
3. Deshpande, J.V. and Purohit S.G. (2005). Life Time Data: Statistical Models and Methods, Word Scientific.

References:

1. Muralidharan,K. and Syamsundar,A.(2012): Statistical Methods for Quality, Reliability and Maintainability, PHI Learning Pvt. Limited.
2. Miller,R.G.(1981) : Survival analysis, John Wiley.

Semester 5:

B18PS5083	**Data mining**	L	T	P	C
Duration:14 Wks		1	1	0	2

Prerequisites:

Knowledge of descriptive statistics, basics of probability, probability distributions and inferential statistics.

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 data warehousing.
3. To examine the types of data to be mined and apply pre-processing methods on raw data.
4. To understand algorithms and tools of data mining used in real world problems.

Course Outcomes:

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

1. Demonstrate the understanding of concepts of data mining and data warehousing.
2. Process raw data to make it suitable for various data mining algorithms.
3. Apply data mining techniques to find interesting knowledge from various types of databases/datasets.
4. Set up a data mining process for an application to carry out a scientific study.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS5083	CO1	3	3	3	2			1	2	3	
	CO2	3	2	2	3			1	3	3	2
	CO3	2	3	3	3			1	3	2	3
	CO4	2	3	2	3			1	3	2	3

Unit1 [6 hrs]

Data Mining: Motivations and importance, Knowledge Discovery in Databases (KDD) process - search, induction, querying, approximation and compression. Kinds of data considered for data mining, basic data mining tasks, data mining issues, inter-connections between Statistics, Data Mining, Artificial Intelligence and Machine Learning. Applications of data mining

Unit2 [6 hrs]

Data warehousing: Data marts, databases and data warehouses - OLTP systems, multidimensional models – data cubes, OLAP operations on data cubes, multidimensional schemas.
Data pre-processing – data cleaning, data integration, data transformation and data reduction.

Unit3 [6 hrs]

Supervised learning – classification and prediction, statistical classification-Linear Discriminants-Mahalanobis' linear discriminant, Regression based classification. k-NN(nearest neighbor) classifier. Tree classifiers-decision trees, ID3 algorithm CART.

Unit4 [6 hrs]

Unsupervised learning: Clustering problem, similarity and distance measures, Partitioning algorithms-k-means & k-medoids(PAM) algorithms.

Text Books:

1. .Jiawei Han, Micheline Kamber: (2002): Data Mining-Concepts and Techniques, Morgan Kaufman Publishers, U.S.A
2. Margaret.H.Dunham (2005): Data Mining-Introductory and Advanced Topics, Pearson Education.
3. Rajan Chattamvelli: (2009): Data Mining Methods, Narosa Publishing House

References:

1. Trevor Hastie, Robert Tibshirani & Jerome Friedman (2001):The Elements of Statistical

Learning: Data Mining, Inference and Prediction, Springer, New York,
2. Michael Berthold, David J. H and (Eds): (2003) Intelligent Data Analysis - An Introduction (2nd Ed), Springer.
3. J.P. Marques de Sa: (2001):Pattern Recognition - Concepts, Methods and Applications, Springer 6

B18PS5X10	Physics lab- V	L	T	P	C
Duration :16Wks		0	0	2	2

Prerequisites:

Fundamentals of Electronics, concepts of light.

Course Objectives:

The objectives of this course are to:

1. The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies. To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipments.
2. Design of circuits using new technology and latest components and to develop practical applications of engineering materials and use of principle in the right way to implement the modern technology.

Course Outcomes:

On completion of this course the student shall be able to:
1. Determination of the few physical constants through experiments
2. Demonstrate the various experiments related to electronics such as Oscillators, multiplier, logic gates and Transistor.
3. Verify various theorems by experiments.
4. Estimate the e/m value of an electron.

Mapping of Course Outcomes with programme Outcomes

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

B18PS5X10	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

Lab Experiments

1. Ionization potential of xenon.
2. The e/m of an electron using a bar magnet (Thomson effect).
3. Estimation of mass of an electron.
4. Determination of Planck constant using a photo cell/ Solar cell.
5. Basic logic gates.
6. Hartley Oscillator.
7. Cockroft-Walton Voltage multiplier.
8. Transistor characteristics -CE mode
9. Study of Spectra of Hydrogen Spectra using Gas Discharge tube Determination of Rydberg Constant.
10. The e/m of an electron by helical coil method or Helmholtz coil method.

Text books:

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 – B.L. Worshnop and H.T. Flint (KPH)

4. Practical Physics – S. L. Gupta &V. Kumar (PragatiPrakashan).

B18PS5X20	Physics lab- VI	L	T	P	C
Duration :16Wks		0	0	2	2

Prerequisites:

Fundamentals of Electronics and concepts of light.

Course Objectives:

The objectives of this course are to:

1. The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies. To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipments.

2. Design of circuits using new technology and latest components and to develop practical applications of engineering materials and use of principle in the right way to implement the modern technology.

Course Outcomes:

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

1. Determination of the few physical constants through experiments
2. Demonstrate the various experiments related to electronics such as Oscillators, multiplier, logic gates and Transistor.
3. Verify various theorems by experiments.
4. Estimate dielectric constant of given material

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS5 X10	CO1	3	3	3	2	2				2	3
	CO2	3	3	3	2	2				3	3
	CO3	2	2	1	3	2				3	2
	CO4	2	2	1	2	1				2	2

1. Determination of wavelength of laser light by grating.
2. RC coupled amplifier two stage.
3. Bridge rectifier with C and Pi filter.
4. Zener diode : to study the characteristics and voltage regulator.
5. Energy gap of a semiconductor by four probe method.
6. Determination of range of electron in Al using GM counter.
7. Determination of dielectric constant of given liquid.
8. To determine value of Boltzman constant using V-I charcterstics of PN diode.
9. Fermi energy of copper by meter bridge.

Text books:

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 – B.L. Worshnop and H.T. Flint (KPH)

4. Practical Physics – S. L. Gupta &V. Kumar (PragatiPrakashan).

B18PS5X30	Design and Analysis of Experiments Lab	L	T	P	C
Duration:14 Wks		0	0	2	2

Prerequisites:

Knowledge of basics statistics-I & II, basics mathematics, differentiation, and basics statistical inference-I & II.

Course Objectives:

1. To equip the students with the basic concepts, theory and applications of ANOVA technique.
2. To guide the students to understand the concepts, issues and principles of design of experiments.

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3. To construct a good designs for different practical experiments.
4. To describe the statistical analysis of experimental data.

Course Outcomes:

Upon completion of the course, students will be able to
1. Explore the basic theory of ANOVA technique and apply it to real-life data.
2. Understand the basic concepts and principles of experimental design.
3. Construct optimal or good designs for a range of practical experiments
4. Describe how the analysis of data pertaining to different experimental designs can be carried out.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PSO1	PSO2
B18PS 5X30	CO1	2	3	3	3	2	2	2	1	3	3
	CO2	2	3	2	3	1	2	2	1	3	2
	CO3	2	3	2	3	1	2	1	1	3	3
	CO4	2	3	2	3	1	2	1	1	2	3

Lab Experiments

(Demonstration of practicals using MS Excel)
1. ANOVA for one way classified data.
2. ANOVA for two way classified data.
3. Analysis of CRD.
4. Analysis of RBD.
5. Analysis of LSD.
6. Missing plot techniques in RBD and LSD
7. Analysis of 2^2 factorial experiment using RBD layout.
8. Analysis of 2^3 factorial experiment using RBD layout.
9. Analysis of 2^3 factorial experiment using RBD layout. (Complete confounding)
10. Analysis of 2^3 factorial experiment using RBD layout. (Partial confounding)

Text books:
1. Montgomery, D.C. (2014). *Design and Analysis of Experiments*, Wiley. New York.

2. Goon A.M., Gupta, M.K., Das Gupta, B. (1991). *Fundamentals of Statistics*,Vol.I, World Press, Calcutta.

3. Joshi, D. D. (1987).*Linear Estimation and Design of Experiments*, New Age International (P) Limited, New Delhi.

Reference Books:

3. Mukhopadhya, P.(2015): *Mathematical Statistics,* Books and Allied (P) Ltd., Kolkata.

4. Cochran, W.G. and Cox, G. M. (1992). *Experimental Designs*, John Wiley and Sons, New York.

Semester VI:

B18PS6010	**Nuclear Physics**	L	T	P	C
Duration:14 Wks		**2**	**1**	**0**	**3**

Prerequisites:

Basic knowledge on fundamentals of nuclear Physics.

Course Objectives:

1) Introduce students to the fundamental principles and concepts governing nuclear physics and have a working knowledge of their application to real-life problems.
2) Relate the core concepts in physics to more advanced topics in nuclear and particle physics.
3) Provide students with opportunities to develop basic knowledge and understanding of radioactivity decay.

Course Outcomes:

1. Understand the fundamental principles and concepts governing classical nuclear and particle physics and have a working knowledge of their application to real-life problems.
2. Apply knowledge of core concepts in physics to more advanced topics in nuclear and particle physics.
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

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6010	CO1	3	3	2	2	1				3	3
	CO2	3	3	2	1	1				3	3
	CO3	3	3	2	1	1				3	2
	CO4	3	2	2		1				3	2

Course Contents:

UNIT-I 9 Hrs

The Nucleus: Properties of nucleus, Neutron discovery and Properties. The proton-neutron hypothesis. Nuclear forces and their characteristics. Yukawa's theory (qualitative).

Radioactive Decay: Successive disintegration, radioactive equilibrium radioactive series, Range and energy of alpha-particle and their measurement. Theory of alpha-decay (qualitative), Geiger-Nuttal law. Beta Decay – Pauli's neutrino hypothesis K-electron capture, internal conversion, Nuclear isomerism. Mirror nuclei, Gamma decay (qualitative).

UNIT-II 9 Hrs

Accelerators: Cockroft-Walton voltage multiplier. LINAC, Cyclotron, Betatron.

Nuclear Detectors: Bubble chamber. G.M.counter, Principle of semiconductor detector.

Nuclear Models: Liquid-drop model, Semi empirical mass formula. Shell model and magic numbers

UNIT-III 9 Hrs

Nuclear reactions: Q-values. Threshold energy of an endoergic reaction, Reactions induced by proton, deutron and -particles.

Nuclear Fission, Fusion and reactors: Estimation of the Fission energy on the basis of the liquid-drop model, Thermo-nuclear reactions sources of stellar energy. The C-N cycle, Magnetic bottle, Nuclear reactors-types. The four-factor formula, Pressurized Heavy water reactor.

UNIT-IV 9 Hrs

Particle Physics and Cosmic Rays: Mention of the basic interactions in nature, Particles and anti-particles. Types of interaction between elementary particles. Conservation laws. A qualitative introduction to quarks (quark model), standard model qualitative, Big bang theory qualitative Cosmic ray Discovery, Primary and secondary cosmic rays- their composition. Cosmic ray showers. Origin of cosmic rays.

Reference Books:

1. A. Beiser: Concepts of modern physics, 6thedition, TMH, New Delhi.2008.

2. Irving Kaplan: Nuclear Physics, 2ndedition, Narosa Publishing House, 1987(Reprint2002).

3. K. S. Kranes: Introductory Nuclear Physics, Wiley India, 2008.

4. S. N. Ghoshal: Nuclear Physics, 1st edition,
S. Chand and Co, 1994(Reprint 2002) .

5. D.C.Tayal : Nuclear Physics, 5th edition, Himalaya Publishing House, 2008

6. Robert Eisberg, Quantum Phyiscs of Atoms molecules, solids nuclei and particles, second
   edition, 1999

7. A K Saxena, Narosa : Principles of Modern Physics Publishers, 4th edition, 2014

8. H. Semat and I.R. Albright : Introduction to atomic and nuclear physics.

9. K. S. Kranes: Introductory Nuclear Physics, Wiley India, 2008

10. M K PAL , Theory of Nuclear Structure, East-West Press Delhi (1983).

B18PS6020	**Numerical Methods**	L	T	P	C
Duration:14 Wks		1	1	0	2

Prerequisites:

Differential Equations and Linear Algebra

Course Objectives:

1. To provide students with an introduction to the field of numerical analysis.
2. The course aims to: further develop and apply problem solving skills through the introduction of numerical methods.
3. To provide a ground for applying knowledge acquired in previous mathematics courses and give students an opportunity to develop and present an independent project.

Course Outcomes:

1. Effectively write mathematical solutions and their interpretation in a clear and concise manner.
2. Identify the steps required to carry out a piece of research on a topic within Numerical Analysis.
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.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6020	CO1	3	2	2	1					3	3
	CO2	3	2	2	1					3	3
	CO3	2	2	2	1	1				3	3
	CO4	3	2	2	1	1				3	3

Course Contents:

Unit-I: Numerical Solution of algebraic and system of equations   **9Hrs**
Solution of Algebraic and Transcendental Equations: Bisection method, Iteration method, the method of False Position, Newton Raphson method.
Solution of linear systems – Matrix inversion method – Gaussian Elimination method – power method – Method of factorization – Iterative methods.

Unit-II: Finite Difference and Interpolation   **9Hrs** Finite
differences: Forward difference, Backward difference and Shift Operators – Separation of symbols – Newton's Formulae for interpolation – Lagranges interpolation formulae - Numerical differentiation – Numerical integration: Trapezoidal rule, Simpson's one-third rule and Simpson's three-eighth rule.

Unit-III: Numerical Solution of First order Differential Equations   **9Hrs**
Numerical solution of ordinary differential equations – Taylor's series – Picard's method – Euler's method – Modified Euler's method – RungeKutta methods - second order (with proof) and fourth order (without proof).

Unit-IV: Numerical Solution of Second order
Differential Equations and simultaneous DE   **9Hrs**
Numerical solution of ordinary differential equations of second order and simultaneous differential equations – Taylor's series – Picard's method – Euler's method – Modified Euler's method – RungeKutta method of fourth order.

Text Books:
1. S S Sastry, Introductory methods of Numerical Analysis, 3rd ed. New Delhi, India: Prentice Hall of India, 1999.
2. Francis Scheid, Schaum's Outline of Numerical Analysis, Revised ed.: Mc.Graw Hill., 2006.

3. G K Ranganath, Text book of B.Sc. Mathematics, Revised ed. New Delhi, India: S Chand and Company Ltd., 2011

Reference Books:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 8th ed. New Delhi, India: Wiley India Pvt. Ltd., 2010.
2. 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.

B18PS6030	Operations Research	L	T	P	C
Duration:14 Wks		1	1	0	2

Prerequisites:

Knowledge of linear algebra, basics of probability and probability distributions

Course Objectives:

1. To study the fundamentals of operations research.
2. To understand the mathematical formulation of linear programming problems and their applications in real life problems.
3. To study various operational research techniques and models.

Course Outcomes:

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

1. Demonstrate the understanding of fundamentals of operations research.
2. Develop a mathematical formulation of an LPP.
3. Apply appropriate operational research techniques and models to real life situations.
4. Understand various decision making problems and their solutions.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6030	CO1	3	3	3	2			1	2	3	

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

Course Contents:

Unit 1 [9hrs]

Introduction to OR and LPP: Definition, scope and phases of operations research (OR). Modeling and solution. Various types of OR problems**.** Linear programming problem (LPP): Definition, standard and canonical forms. Formulation of LPP. Basic feasible solutions, degenerate and non degenerate solutions. Graphical solution and simplex algorithm for solving an LPP.Artificial variable, Charnes' Big- M Method. Criteria for unbounded, multiple, and infeasible solutions

Unit2 [9hrs]

Transportation and assignment problems: Mathematical formulation of transportation problem. Existence of feasible solution. Finding initial basic feasible solution: North - West corner rule and Vogel's method. Test for optimality. Transportation algorithm. Problem of degenerate solution. Unbalanced transportation problem. Mathematical formulation of assignment problem and Hungarian algorithm. Unbalanced assignment problem.

Unit 3 [9hrs]

Inventory and replacement theory: Description of an inventory system. Inventory costs. Demand, lead time, and reorder level. Inventory models. EOQ model with and without shortages. Need for replacement. Replacement policy for items which deteriorate with time. Optimum policy with discrete and continuous time. Group replacement policy.

Unit 4 [9hrs]

Game Theory and Network theory

Game Theory**:** Basic concepts of game theory. Two-person zero sum game. Pure and mixed strategies. Maximin–Minimax principles, Games with saddle point. Principle of dominance Games without saddle point. Mixed strategies. Determination of optimum solution for a 2x2 game. Solution by graphical method for 2xn and mx2 games.

Network theory**:** Basic elements of Network. Drawing of project network. Project planning with CPM and PERT. Critical path calculation. Critical path, slack time, floats. PERT three estimate

approach. Calculation of probabilities of completing a Project within a specified period.
.

Text Books:

1. Churchman, C.W, Ackoff, R.L., and Arnoff, E.L. (1957). *Introduction to Operations Research*, John Wiley and Sons, New York.
2. Kanthi Swaroop, Manmohan and P.K. Gupta (2012). *Operations Research,* Sultan Chand, New Delhi.
3. Kalavathy, S.(2004). *Operations Research*, Vikas Publishing House Pvt. Ltd. New Delhi.
4. Shenoy, G.V., Srivastava, U. K., and Sharma, S.C. (2009). *Operations Research for Management, 2/e,* New Age International, New Delhi.

References:

1. Mustafi, C.K. (2006). *Operations Research: Methods and Practice*, 3/e, New Age International, New Delhi.
2. Mital, K.V. and Mohan, C. (2004). *Optimization Methods,* 3/e, New Age International, New Delhi.
3. Narag, A. S. (1970). *Linear Programming and Decision Making,* S. Chand, New Delhi.
4. Hillier, F.S. and Leiberman, G. J. (1962). *Introduction to Operations Research*, Holden Day, New
5. Taha, H.A. (2010). *Operational Research: An Introduction,* Macmillan, New York.

B18PS6041		L	T	P	C
Duration:14 Wks	**Physics of Clouds**	**2**	**0**	**0**	**2**

Prerequisites:

Basic Knowledge on formation of the clouds, atmosphere and its applications

Course Objectives:

1. To provide basic knowledge 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:

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.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6041	CO1	3	3	2	2	1				3	3
	CO2	3	3	2	1	1				3	3
	CO3	3	2	2	1	1				3	3
	CO4	3	2	2		1				3	3

Course Contents:

UNIT I: Fundamental Concepts: 6Hrs
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: 6 Hrs
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: 6Hrs
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: **6Hrs**

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.

Reference Books:

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

B18PS6042	**Astro Physics**	L	T	P	C
Duration:14 Wks		2	0	0	2

Prerequisites:

Knowledge of fundamentals of the Astro Physics

Course Objectives:

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:

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.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6042	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 Contents:

UNIT I: Stellar Physics: **6 Hrs**
Electromagnetic spectrum, Transmission of radiations through atmosphere, Black body radiation and Wien's law, Physical properties of astronomical objects, Spectral classification of stars, H-R diagram, luminosity classification of stars, distance measurement by Parallax method.

UNIT–II: Milky Way Galaxy and Sun: **6 Hrs**
The Milky Way galaxy, inter –stellar medium, inter-stellar molecules, origin of solar system, condensation theory, arguments for and against the theory.

UNIT–III: Solar System **6 Hrs**

The Solar system, Surface of Sun, Sunspot, Sunspot cycle, The Sun: Photosphere, chromospheres and corona. Kepler's laws of Planetary motion, early history of planets, Structure, Composition and Atmosphere of our Solar system (all nine planets), Comets, Asteroids, Meteors, Meteoroids, prospectus for life on Mars.

UNIT–IV: Cosmology **6 Hrs**
The Big-Bang universe, the steady state cosmology, the oscillating cosmology, the Hubble law and cosmological test.

Books Recommended:
1. Astrophysics (Stars and Galaxies) – K.D. Abhyankar (University Press Hyderabad)
2. Observational Astrophysics – Robert C. Smith (Cambridge University Press)
3. Astrophysics- A Modern Perspective- K.S. Krishna Swamy (New Age International)
4. Stars- Life, Death and Beyond – A.K.kimbhavi, J.V.Narlikar (IUCAA-Pune)
5. An Introduction to astrophysics- Baidynath Basu (PHI)
6. Astronomy – Fundamentals and Frontiers – Robert jastrow and M. H. Thompson
(Chap. 9, 12, 14, 15, and 19) Edition, 2nd ed. Publication, Link New York: John Wiley & Sons.

B18PS6043	**Digital Electronics and Communication**	L	T	P	C
Duration:14 Wks		2	0	0	2

Prerequisites:

Basics of the digital electronics and communication

Course Objectives:

1. To Convert values from decimal, binary, octal, hexadecimal, and binary-coded decimal number systems to each other and back to the other systems.
2. To Simply combinational logic circuits with K map
3. To demonstrate and compare different analog modulation schemes.
4. To provide an overview of Satellite communication and its applications in communication

Course Outcomes:

1. Convert values from decimal, binary, octal, hexadecimal, and binary-coded decimal number systems to each other and back to the other systems.
2. Implement logic circuits using universal logic gates.
3. Construct the spectrum of transmission and reception of amplitude modulated and demodulated signals.
4. Explain the block diagram of satellite and TV communication systems.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6043	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	1				3	3

Course Contents:

UNIT I: Number Systems and Logic Gates 6 Hrs

Decimal numbers, Binary numbers, Binary arithmetic, Octal Numbers, Hexadecimal numbers, Inter-conversions of number systems, Binary coded decimal(BCD), Gray code, Excess-3 code.

Logic Gates: AND gate, OR gate, NOT gate, NAND gate, NOR gate, EX-OR and EX-NOR gates, Universal properties of NAND gates.

UNIT-II: **Boolean Algebra**   **6 Hrs**

Boolean operations, logic expressions, Laws of Boolean algebra, De-Morgan's theorems, Simplification of Boolean expressions using Boolean algebra Techniques, SOP and POS form of Boolean expressions for logic network, Simplification of Boolean expressions using K-Map (up to 4variables).

UNIT-III: Modulation and Demodulation: **6 Hrs**

Introduction, Types of Modulation, Expression for Amplitude Modulation voltage, AM waves, Frequency spectrum of AM waves, Power Output in AM waves, Expression for frequency modulated voltage, Principle of demodulation, linear diode AM detector or demodulator.

UNIT-IV: Communication Electronics: **6Hrs**

Introduction, Historical development of Satellite, Communication Satellite, system communication satellite, Orbiting Satellite, Satellite frequency band. Block diagram of Radio transmitter and TRF Radio receiver, Explanations of function of each block, Super heterodyne radio receiver, Explanations of function of each block, Physical basis of T.V., Block diagram of T.V. Receiver.

Books Recommended:

1. Modern Digital Electronics- R.P. Jain, Tata McGraw Hill Pub. Company (Third edition)
2. Digital Fundamentals-Thomas L. Floyd, Universal Book Stall
3. Digital Principles and Applications- A. P. Malvino, (MGH International Edns (Fourth Edition)
4. Digital Electronics with Practical Approach- G. N. Shinde, Shivani Pub., Nanded
5. Electronics and Radio Engineering – M. L. Gupta
5. Monochrome and Colour T. V. –Gulhati.

B18PS6051		L	T	P	C
Duration:14 Wks	Fuzzy Mathematics	**2**	**0**	**0**	**2**

Prerequisites:

Basic Knowledge of Set theory

Course Objectives:

1. To apply the knowledge of operational research in the field of agriculture, industry, transportation and economics
2. To discover the feasible solution for transportation and assignment problems
3. To optimize the existing policies in inventory and replacement theory

4. To explore the various theories of operations research

Course Outcomes:

1. Point out the applications of operations research
2. Identify and outline the problems in transportation and assignment and develop a solution
3. Formulate the policies for various theories in operations research
4. Applying Operational research concepts at Basic research level.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6051	CO1	3	2	2		1				3	3
	CO2	3	2	2	1	1				3	3
	CO3	2	2	2	1	1				3	3
	CO4	3	2	2		1				3	3

Course Contents:

Unit – I   **6 Hrs**

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

Unit – II   **6 Hrs**

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

Unit – III   **6 Hrs**

Introduction- Algebra of fuzzy relations-logic-connectives.

Unit – IV   **6 Hrs**

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

Text Books:

S. Nanda and N. R. Das Fuzzy Mathematical concepts, Narosa Publishing House, New Delhi, 2010.

Reference Books:

M.Ganesh, Introduction to Fuzzy Sets & Fuzzy Logic,Prentice Hall of India Pvt. Ltd., 2006.
John N.Mordeson and Premchand S.Nair, Fuzzy Mathe

B18PS6052		L	T	P	C
Duration:14 Wks	Topology	**2**	**0**	**0**	**2**

Prerequisites:

Set theory and properties of set theory

Course Objectives:

1. 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.
2. The course focuses on Homotopy, Homology theories and Topological groups and Lie groups.

Course Outcomes:

1. Analyse different axioms of Topology.
2. Learn Homotopy Theory.
3. Analyse fundamental groups of S_1 and S_n.
4. Analyse Topological groups and Lie groups.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO 2
B18PS6052	CO1	3	2	2		1				3	3
	CO2	3	2	2	1	1				3	3
	CO3	2	2	2	1	1				3	3
	CO4	3	2	2		1				3	3

Unit-I   **6 Hrs**
General Topology: Introduction, metric topology, separation axioms, compactness, Connectedness, product topology, introduction to manifolds, sub manifolds.

Unit-II   **6 Hrs**
Homotopy Theory. Covering spaces, homotopy maps, homotopy equivalence, Contractible spaces, deformation retraction.

Unit-III   **6 Hrs**
Fundamental Groups: Universal cover and lifting problem for covering maps, Fundamental groups of S1 and Sn. Introduction to Homology Theory.

Unit-IV   **6 Hrs**
Topological Groups: Introduction, integration on locally compact spaces, Haar Measure, Character groups, group action.Lie groups and lie algebras: Basic theory, linear groups.

Suggested texts:
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.

B18PS6053	Discrete Mathematics and Graph Theory	L	T	P	C
Duration:14 Wks		**2**	**0**	**0**	**2**

Prerequisites:

Sets, Relations , Trees , Graphs and Boolean Algebra**.**

Course Objectives:

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
   To apply graph theory based tools in solving practical problems

Course Outcomes:

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.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6053	CO1	3	2	2		1				3	3
	CO2	3	2	2	1	1				3	3
	CO3	2	2	2	1	1				3	3
	CO4	3	2	2		1				3	3

Course Contents:

Unit-I: **Discrete numeric functions and Generating functions:** **6 Hrs**
Introduction, Manipulation of numeric functions, Asymptotic behaviour of numeric functions, Generating functions.Recurrence relations and Recursive Algorithms: Introduction, Recurrence relations, Linear recurrence relation with constant coefficients, Homogeneous solutions, particular solutions.

Unit-II: Boolean algebra: **6 Hrs**

Application of Boolean Algebra to switching theory. Languages - Recognition and generation - Phase structure grammars and languages – Finite state Machine - Recognition in regular languages.

Unit-III: Grpah Theory -1   6 Hrs

Graph ,finite, Infinite graphs, Incidence and degree , Isolated vertex, Pendent vertex, Null graph, Isomorphism, Sub-graphs, Walks, Paths, Circuits, Connected and disconnectedgraphs, Components, Euler graphs, Operation on graphs, Hamiltonian paths, Circuits, Trees and some properties of trees, Rootedand binary tree, Spanning tree and fundamental circuits.

Unit-IV: Grpah Theory -2   6 Hrs

Cutsets, Properties, Fundamental cut sets, Connectivity, Seperability, Planar graphs, Kuratowskiís graphs, Different representation of planar graphs, Geometric dual, Ring sum of two circuits, Subspace, Orthogonal vectors, Matrix representation, Incidence matrix, Cutset matrix, Circuit matrix, Adjacency matrix.

Text Books:

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, Tata Magraw Hill Publishers
3. Kenneth H.Rosen, Discrete Mathematics and its Application, Fifth edition, Tata McGraw-Hill Publishing company PVT .Ltd., New Delhi, 2003 4

Reference Books:

1. Narsing Deo: Graph Theory & Applications (PHI), India.
2. Frank Harrary: Graph Theory Narosa Publications, India.

BPS186061		L	T	P	C
	Applied Statistics	**L**	**T**	**P**	**C**
Duration:14 Wks		**1**	**1**	**0**	**2**

Prerequisites:

Knowledge of basic mathematics and basic statistics

Course Objectives:

1. To study the demographic data with its sources and measures.
2. To learn the fundamentals of index numbers and their types along with their construction.
3. To understand time series data, components of time series and their measurements.
4. To know about official statistical system in India and functions of different agencies.

Course Outcomes:

Upon completion of the course, students will be able to:
1. Demonstrate demographic analysis of real-life data.
2. Understand the fundamentals of index numbers and able to construct index numbers for real life data.
3. Perform basic analysis of time series data
4. Understand the present official statistical system in India and the functions of C.S.O. and N.S.S.O..

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BPS186061	CO1	3	3	3	2			1	1	2	3
	CO2	3	2	2	3			1	3	2	2
	CO3	2	3	3	3			1	3	3	3
	CO4	3	3	2	3			1	3	3	3

Course Contents:

Unit 1 [6 hrs]

Demography: Sources of demographic data. Measurement of mortality: Crude, specific, and standardized death rates. Infant and maternal mortality rates. Measurement of fertility: crude, age specific general, and total fertility rates. Reproduction rates. Life table: Components of a life table, force of mortality, and
Expectation of life. Construction of a lifetable. Uses of a life table.

Unit 2 [6 hrs]

Index numbers: Introduction. Price and quantity index numbers. Construction of index numbers: Simple and weighted methods. Tests for consistency of index numbers. Consumer price index. Problems involved in the construction of general and consumer price index numbers. Uses and limitations.

Unit3 [6 hrs]

Time series analysis: Components of time series. Additive and multiplicative models. Measurements of trend by moving averages and by least squares. Construction of seasonal indices by simple averages and ratio to moving averages.

Unit4 [6 hrs]

Official Statistics and national income: History of Indian Statistical System. Pre and post-independence era .CSO NSSO and their activities. National income. Basic concepts of GNP, GDP, NNP. National Income at factor cost – NDP, per capita income. Real national income. Methods of estimating national income. Problems in estimating national income. Uses of national income statistics. National accounts statistics of CSO.

Text Books:

1.Goon A.M., Gupta, M.K., Das Gupta, B. (1991). *Fundamentals of Statistics*, Vol. II, World Press, Calcutta.
2.   Montgomery, D.C. and Runger, G.C. (2013). *Applied Statistics and Probability for Engineers,* Wiley India, New Delhi.
3.   Saluja, M. R. (1972). Indian Official Statistical Systems, Statistical Publishing Society, Calcutta

References:
1.   CSO (1980). *National Accounts Statistics* - Sources and Health, Govt. of India, New Delhi.
2.   UNESCO: Principles for Vital Statistics Systems. Series M -12.
3.   Sen, A. (1997). Poverty and Inequality, Stanford University Press, USA.
4.   Mukhopadhyay, P. (2015). *Applied Statistics,* Books and Allied Pvt Ltd., Kolkata.

Semester 6:

B18PS6062	Econometrics	L	T	P	C
Duration:14 Wks		1	1	0	2

Prerequisites:

Knowledge of linear algebra, calculus, descriptive statistics, probability distributions and statistical inference.

Course Objectives:

1. To develop an understanding of fundamental concepts of econometric models.
2. To introduce regression analysis to students so that they are able to understand its applications in different fields in economics.
3. To know the assumptions and inferential aspects of regression models.

Course Outcomes:

Upon completion of the course, students will be able to:
1. Demonstrate an understanding of fundamental concepts of econometric models.
2. Specify the assumptions and perform an inferential analysis of regression models.
3. Apply econometric models to real life data.
4. Distinguish the results of violating the assumptions of classical regression model

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6062	CO1	3	3	3	2			1	1	2	
	CO2	3	2	2	3			1	3	2	2
	CO3	2	3	3	3			1	3	3	3
	CO4	3	3	2	3			1	3	3	3

Course Contents:

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Unit 1 [6hrs]

Introduction: Econometrics-nature, models-linear and non-linear, aims, types of data. Econometrics and statistics. Econometrics and regression analysis.

Unit2 [6hrs]

Simple linear regression analysis: Definition. Model, Ordinary Least Square(OLS) estimators-properties, Inference in the least square model.

Unit3 [6hrs]

Multiple linear regression analysis: Definition, model, assumptions of model, Ordinary Least Square(OLS) estimators-properties, Guass-Morkov theorem, concept of ANOVA and R-square, Inference in the model.

Unit4 [6hrs]

Violations of Classical Assumptions: Multicollinearity: Sources, Consequences, Detection and Remedies; Heteroscedasticity- tests, consequences, detection and solution; Autocorrelation-sources, consequences, detection and remedial measures.

Text Books
1. Jack Johnston and John DiNardo (1997):Econometric Methods, Third edition, McGraw Hill.
2. G.S. Maddala (2002): Introduction to Econometrics, Third edition, John Wiley.
3. Damodar Gujrati (2003):Basic Econometrics, McGraw Hill.

References
1. Badi H. Battagi (2002): Econometrics, 3rd Ed., Springer
2. Draper N.R. and Smith H. (1998): Applied Regression Analysis, 3rd Ed., John Wiley and Sons, Inc.

B18PS6063	Actuarial Statistics	L	T	P	C
Duration:14 Wks		1	1	0	2

Prerequisites:

Knowledge of financial mathematics, linear algebra, calculus, descriptive statistics, probability distributions and statistical inference.

Course Objectives:

1. To provide students with the theoretical background needed to qualify them to pursue graduate level education in Actuarial Science or related fields.

2. To equip students to apply mathematical and statistical knowledge in the field of insurance and finance.
3. To equip students with concepts of actuarial science and different premium models
4. To assist students to construct mathematical and statistical models for real life data in the field of insurance, finance and financial risk management

Course Outcomes:

Upon completion of the course, students will be able to:
1. Demonstrate a solid foundation in actuarial statistics.
2. Understand the concepts of actuarial science and different premium models
3. Apply actuarial statistics in various fields like insurance, finance and financial risk management.
4. Use appropriate modeling techniques to conduct quantitative risk analysis.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6063	CO1	3	3	3	3			1	1	3	
	CO2	3	2	2	3			1	3	3	1
	CO3	2	3	3	3			1	3	1	3
	CO4	3	3	2	3			1	3	2	3

Course Contents:

Unit1 [6 hrs]

Insurance business: – Introduction, Insurance Companies as Business Organizations, Concept of Risk, types of risk, characteristics of risk; premium, policy, policyholder and benefit. Role of Statistics in insurance, insurance business in India.

Unit2 [6 hrs]

Survival distribution: Future life time random variable- distribution function and density function, concept of force of mortality, curate future life time random variable its probability mass function, deferred probabilities, all these functions in terms of international actuarial notation.

Unit3 [6 hrs]

Life tables: Life table and its relation with survival function, examples, assumptions for fractional

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ages, some analytical laws of mortality, select and ultimate tables.

Unit4   **[6 hrs]**

Principles of compound interest: Nominal and effective rates of interest and discount, force of interest and discount, compound interest, accumulation factor, continuous compounding.

Text books:

1. Bowers N.L. Jr., H.S.Gerber, J.C. Hickan, D.A.Jones, C.J.Nesbitt, (1997). Actuarial Mathematics, Society

   of Actuaries, U.S.

 2. Deshmukh, S. R. (2009). Actuarial Statistics, Universities Press, Hyderabad, India.

References:

1. Dickson, C. M. D. (2005): Insurance Risk And Ruin (International Series On Actuarial Science), Cambridge University Press.
2. Benjamin, B. and Pollard, J.H. (1980) Analysis of Mortality and Other Actuarial Statistics, 2nd edition, Heinemann, London.

B18PS6070	**MOOC / SWAYAM / Internship**	L	T	P	C
Duration :14 Wks		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

B18PS6080	Soft Skill	L	T	P	C
Duration :14 Wks		1	1	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.

B18PS6090	Physics Lab – VII	L	T	P	C
Duration :14 Wks		0	0	1	3

Prerequisites:

Number system, combinational circuits, sequential circuits

Course Objectives:

Course objectives are to:
1. To impart the practical knowledge
2. To train the students to do the experiments in a systematic way, collect the data and analyze it.
3. To motivate the students to think in more practical way by giving the hands on training.

Course Outcomes:

After completion of the course a student will be able to:
1. Conduct the experiments related to different Physics laws and theories.
2. Employ the different tools and techniques to get the data/readings related to the experiments.
3. Verify the fundamental physics behind many scientific discoveries through hands on experimentation.
4. Study of X- ray Photographic plates

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6090	CO1	3	2	2		1				3	3
	CO2	3	2	2	1	1				3	3
	CO3	2	2	2	1	1				3	3
	CO3	2	2	2	1	1				2	2

Course Contents:

1. Verification of inverse square law for gamma-rays
2. Half-life of K 40
3. Absorption coefficient of gamma-rays
4. Study of solar cell-I V Characteristics, F F& efficiency
5. Phase measurement in LCR circuit using CRO
6. Four probe- Resistivity measurements
7. Verification of Maximum power transfer theorem.
8. Negative feed-back amplifier.
9. Study of X-ray photograph – determination of interplanar distance
10. Characteristics of a GM-tube.

Text books:

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

Reference Books:

13. G.L.Souires, "Practical Physics:", 4th Edition, Cambridge University, UK, 2001.
14. D. Chattopadhyay, P. C. Rakshit and B. Saha, "An Advanced Course in Practical Physics", 2nd ed., Books & Allied Ltd., Calcutta, 1990.
15. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)
16. Practical Physics – S. L. Gupta &V. Kumar (PragatiPrakashan).

B18PS6X10	Mathematics Lab - V	L	T	P	C
Duration :14 Wks		0	0	2	2

Prerequisites:

Knowledge of Network analysis, Integration and differentiation, Matrix equations, Laplace Transform.

Course Objectives:

The objectives of this course are:
1. Interpret derivatives of vector valued functions as velocity and acceleration functions.
2. Learn to evaluate multiple integrals.
3. Explain the definition and properties of vector space and its base.
4. State the linear transformation and find range, image, rank and nullity of the given transformation

Course Outcomes:

After completion of the course a student will be able to:
1. Determine and apply, divergence, curl, and scalar potential associated with scalar and vector fields.
2. Apply Fundamental theorem to evaluate Area, Region and Volume of geometrical bodies using Green's theorem, Stoke' s theorem, or Gauss divergence theorem .
3. Describe and manipulate vector spaces, subspaces and their bases**.**
4. Determine the kernel, image space and matrix representation of a linear transformation.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6X10	CO1	3	2	2		1				3	3
	CO2	3	2	2	1	1				3	3
	CO3	2	2	2	1	1				3	3
	CO4	3	2	2		1				3	3

Course Contents:

1) Verification of Green's theorem.
2) Verification of Gauss Divergent theorem.
3) Verification of stokes theorem
4) i. Expressing a vector as   a linear combination of given set of vectors
   ii. Examples on linear dependence and independence of vectors
5) i. Evaluation of basis and dimension
   ii. Verifying whether a given transformation is linear or not
6) Finding a matrix of linear transformation
7) Finding a linear transformation of a matrix.
8) Verification of Rank nullity theorem.
9) To demonstrate the physical interpretation of gradient , divergence and curl

10) To write gradient, divergence, curl and laplacian in cylindrical coordinates
11) To write gradient divergence, curl and laplaction in spherical co ordinates.
12) i. Evaluation of the line integral with constant limits
    ii. Evaluation of the line integral with variable limits
13) i. Evaluation of the double integral with constant limits
    ii. Evaluation of the double integral with variable limits
14) i. Evaluation of the triple integral with constant limits
    ii . Evaluation of the triple integral with variable limits
15) Evaluation of surface area of revolution
16) Evaluation of volume of revolution.

B18PS6X20	Numerical Methods – Lab	L	T	P	C
Duration:14 Wks		0	0	2	2

Prerequisites:

Basic concepts of numerical methods

Course Objectives:

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: further develop and apply problem solving skills through the introduction of numerical methods;
3. To provide a ground for applying knowledge acquired in previous mathematics courses; and give students an opportunity to develop and present an independent project.

Course Outcomes:

1. Acquire proficiency in using MAXIMA to study Numerical Analysis.
2. Use MAXIMA to solve the system of equations
3. Be familiar with the built-in functions to find largest eigen value using power method.
4. Acquire proficiency in using Maxima to study the solution of Integrals using interpolation.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19PS6X20	**CO1**	3	2	2		1				3	3

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

Course Contents:

1. Solving algebraic equation using Bisection method
2. Solving algebraic equation using Regula – Falsi method
3. Solving algebraic equation using Newton – Raphson method
4. Solving system of equation using Jacobi method
5. Solving system of equation using Gauss – Seidel method
6. Solving for largest Eigen value by power method
7. Solving ordinary differential equation by modified Euler's method.
8. Solving ordinary differential equation by Runge - kutta methods of 4th order.
9. Evaluating integrals using Trapezoidal Rule.
10. Evaluating integrals using Simpson's $\frac{1}{3}$ rd rule.
11. Evaluating integrals using Simpson's $\frac{3}{8}$ th rule.
12. Finding values of functions using interpolation.

B18PS6X30	Operations Research Lab	L	T	P	C
Duration:14 Wks		0	0	2	2

Prerequisites:

Knowledge of linear algebra, basics of probability and probability distributions

Course Objectives:

1. To make students to gain practical knowledge to co-relate with the theoretical studies.
2. To prepare students to formulate real-world problems as a linear programming problem
3. To know to obtain optimal solution to a given LPP using different methods.

Course Outcomes:

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

1. Demonstrate the understanding of theoretical knowledge practically.
2. Formulate real-world problems as a linear programming problem
3. Obtain optimal solution to a given LPP using different methods
4. Demonstrate the solution methods to different LPP's

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B18PS6X30	CO1	3	3	3	2	1		1	1	2	3
	CO2	3	2	2	3	1		1	3	1	2
	CO3	2	3	3	3	1		1	3	3	3
	CO4	3	3	2	3	1		1	3	3	3

Lab Experiments

1. Formulation of linear programming problem (LPP) - graphical solution.
2. Solution of LPP - simplex algorithm - 1
3. Solution of LPP - simplex algorithm - 2
4. Transportation problems - 1 (IBFS)
5. Transportation problems - 2 (OBFS)
6. Assignment problems
7. Game theory problems.
8. Inventory problems
9. Replacement problems
10. PERT & CPM

Text Books:

1. Churchman, C.W, Ackoff, R.L., and Arnoff, E.L. (1957). *Introduction to Operations Research*, John Wiley and Sons, New York.
2. Kanthi Swaroop, Manmohan and P.K. Gupta (2012). *Operations Research,* Sultan Chand, New Delhi.
3. Kalavathy, S.(2004). *Operations Research*, Vikas Publishing House Pvt. Ltd. New Delhi.
4. Shenoy, G.V., Srivastava, U. K., and Sharma, S.C. (2009). *Operations Research for Management, 2/e,* New Age International, New Delhi.

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References:
1. Mustafi, C.K. (2006). *Operations Research: Methods and Practice*, 3/e, New Age International, New Delhi.
2. Mital, K.V. and Mohan, C. (2004). *Optimization Methods,* 3/e, New Age International, New Delhi.
3. Narag, A. S. (1970). *Linear Programming and Decision Making,* S. Chand, New Delhi.
4. Hillier, F.S. and Leiberman, G. J. (1962). *Introduction to Operations Research*, Holden Day, New
5. Taha, H.A. (2010). *Operational Research: An Introduction,* Macmillan, New York.

CAREER DEVELOPMENT AND PLACEMENT

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

1. Willingness to learn
2. Self motivation
3. Team work
4. Communication skills and application of these skills to real scenarios
5. Requirement of gathering, design and analysis, development and testing skills
6. Analytical and Technical skills
7. Computer skills
8. Internet searching skills
9. Information consolidation and presentation skills
10. Role play
11. Group discussion, and so on

REVA University, therefore, has given utmost importance to develop these skills through variety of training programs and such other activities that induce the said skills among all students. A full-fledged Career Counseling and Placement division, namely Career Development Center (CDC) headed by well experienced senior Professor and Dean and supported by dynamic trainers, counselors and placement officers and other efficient supportive team does handle all aspects of Internships and placements for the students of REVA University. The prime objective of the CDC

is to liaison between REVA graduating students and industries by providing a common platform where the prospective employer companies can identify suitable candidates for placement in their respective organization. The CDC organizes pre-placement training by professionals and also arranges expert talks to our students. It facilitates students to career guidance and improve their employability. In addition, CDC forms teams to perform mock interviews. It makes you to enjoy working with such teams and learn many things apart from working together in a team. It also makes you to participate in various student clubs which helps in developing team culture, variety of job skills and overall personality.

The need of the hour in the field of Physics, Mathematics and Statistics 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 MOU's with Multi-National Companies, research institutions, and universities abroad to facilitate greater opportunities of employability, students' exchange programs for higher learning and for conducting certification programs.

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