

**10**  
YEARS

OF UNIVERSITY  
RECOGNITION

**20**  
YEARS OF  
ACADEMIC  
EXCELLENCE



**REVA**  
UNIVERSITY

Bengaluru, India

# School of Applied Sciences B.Sc. PMCs

## HANDBOOK 2019-2022

Rukmini Knowledge Park  
Kattigenahalli, Yelahanka, Bengaluru – 560064

[www.reva.edu.in](http://www.reva.edu.in)



## **School of Applied Sciences**

**B. Sc - (Physics, Mathematics and Computer science)**

### **HAND BOOK 2019-22**

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

## 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 19 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. (B B G) degree program of REVA University is designed to prepare bio technologist, biochemists, geneticists, 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 and congenial environment for your studies. I wish you and all students' pleasant stay in REVA and grand success in your career.

The curriculum caters to and has relevance to local, regional, national, global developmental needs.

Maximum number of 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**

## CONTENTS

| Sl.No. | Particulars  | PageNo. |
|--------|--|---------|
| 1      | Message from the Honorable Chancellor  | 3       |
| 2      | Message from the Vice- Chancellor  | 4       |
| 3      | Director Message   | 6       |
| 4      | Rukmini Educational Charitable Trust   | 8       |
| 5      | About REVA University  | 9       |
| 6      | About School of Applied Sciences<br>- Vision<br>- Mission<br>- Values  | 13      |
| 7      | <b>B. Sc (Physics, Mathematics and Computer science)</b><br>- Program Overview<br>- Program Educational Objectives<br>- Program Outcomes<br>- Program Specific Outcomes<br>- Eligibility for Admission | 17      |
| 8      | Regulations Governing Applied Science Programmes   | 19      |
| 9      | Curriculum - UG  | 35      |
| 10     | Career Development and Placement   | 187     |

## **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 7<sup>th</sup> February, 2013. The University is empowered by UGC to award degrees any branch of knowledge under Sec.22 of the UGC Act. The University is a Member of Association of Indian Universities, New Delhi. The main objective of the University is to prepare students with knowledge, wisdom and patriotism to face the global challenges and become the top leaders of the country and the globe in different fields.

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

The University is presently offering 23 Post Graduate Degree programs, 20 Degree and PG Degree programs in various branches of studies and has 15000+ students studying in various branches of knowledge at graduate and post graduate level and 410 Scholars pursuing research leading to PhD in 19 disciplines. It has 800+ well qualified, experienced and committed faculty members of whom majority are doctorates in their respective areas and most of them are guiding students pursuing research leading to PhD.

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

them confidence and courage to move forward and accomplish success in their career. The University has

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

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

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

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

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

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

As a part of our effort in motivating and inspiring youth of today, REVA University also has instituted awards and prizes to recognize the services of teachers, researchers, scientists, entrepreneurs, social workers and such others who have contributed richly for the development of the society and progress of the country. One of such award instituted by REVA University is '**Life Time Achievement Award**' to be awarded to successful personalities who have made mark in their field of work. This award is presented on occasion of the "**Founders' Day Celebration**" of REVA University on 6<sup>th</sup> 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 Vedaaya, - Graduation Day for the final year students of all the programs, wherein, the outgoing students are felicitated and are addressed by eminent personalities to take their future career in a right spirit, to be the good citizens and dedicate themselves to serve the society and make a mark in their respective spheres of activities. During this occasion, the students who have achieved top ranks and won medals and prizes in academic, cultural and sports activities are also recognized by distributing awards and prizes. The founders have also instituted medals and prizes for sports achievers every year. The physical education department conducts regular yoga classes everyday to students, faculty members, administrative staff and their family members and organizes yoga camps for villagers around. Recognizing the fast growth of the university and its quality in imparting higher education, the BERG (Business Excellence and Research Group), Singapore has awarded BERG Education Award 2015 to REVA University under Private Universities category. The University has also been honored with many more such honors and recognitions.

### **Vision**

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

### **Mission**

To create excellent infrastructure facilities and state-of-the-art laboratories and incubation centers  
To provide student-centric learning environment through innovative pedagogy and education reforms

To encourage research and entrepreneurship through collaborations and extension activities

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

To organize society development programs for knowledge enhancement in thrust areas

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

### **Objectives**

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

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

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

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

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

## **ABOUT SCHOOL OF APPLIED SCIENCES**

The School of Applied Sciences offers graduate and post graduate programs in Biotechnology, Biochemistry, Chemistry, Physics and Mathematics which are incredibly fascinating. It aims to attract talented youth and train them to acquire knowledge and skills useful to industrial sectors, research laboratories, and educational institutions. The School presently offers B.Sc. degree programs in Bio-Chemistry, Bio-Technology, Chemistry, Physics, Mathematics and B Sc with various combinations viz, Biotechnology, Biochemistry and Genetics, Physics Chemistry and Mathematics, 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      | <b>Dr. D V Sunitha</b><br>Associate Professor & Coordinator<br>Department of Physics, REVA University<br>Ph: +91-7760884884; <a href="mailto:sunithadv@reva.edu.in">sunithadv@reva.edu.in</a>   | Chairman                         |           |
| 2      | <b>Dr. M Madesh Kumar</b><br>Associate Professor, Department of Physics<br>REVA University<br><a href="mailto:madeshkumar@reva.edu.in">madeshkumar@reva.edu.in</a> ; 9341271290   | Physics – Internal<br>Member     |           |
| 3      | <b>Dr.J. Malleshappa</b><br>Assistant Professor, Department of Physics,<br>University College of Science<br>Tumkur University, Tumkur 560004<br>Ph: +91- 9448759073p; Email:<br><a href="mailto:jmallesh.phy@gmail.com">jmallesh.phy@gmail.com</a>  | Physics –<br>External Member     |           |
| 4      | <b>Dr.K.M. Eshwarappa</b><br>Associate Professor<br>Department of PG studies and Research in<br>Physics, Government First Grade college<br>Holenarsipura 573211, Hassan, Karnataka<br>Ph:+91-9036830242; E-<br>mail: <a href="mailto:km.eshwarappa@gmail.com">km.eshwarappa@gmail.com</a> | Physics –<br>External Member     |           |
| 5      | <b>Dr J B Prasanna Kumar</b><br>Assistant Professor, GFGC<br>Tumkur University, Tumkuru<br>Ph:+91-9964521358; E-mail:<br><a href="mailto:prasanakumarjb39@gmail.com">prasanakumarjb39@gmail.com</a>   | Physics –<br>External Member     |           |
| 6      | <b>Dr. Harish Babu G A</b><br>Professor and Coordinator, Department of<br>Mathematics, REVA University<br><a href="mailto:harishbabuga@reva.edu.in">harishbabuga@reva.edu.in</a> ; 9845549977   | Mathematics –<br>Internal Member |           |
| 7      | <b>Prof. Sivakumar P</b><br>Assistant Professor,<br>Department of Mathematics,REVA University,<br><a href="mailto:sivakumarpathuri@revainstitution.org">sivakumarpathuri@revainstitution.org</a><br>8453584045  | Mathematics –<br>Internal Member |           |
| 8      | <b>Dr. Machhindranath Manikyarao Dhani</b><br>Asso. Professor, Department of Mathematics ,<br>GFGC Yelahanka<br><a href="mailto:drdhani.99dce@gmail.com">drdhani.99dce@gmail.com</a> , 7795707799   | Mathematics -<br>External Member |           |
| 9      | <b>Dr. Latha Devi P</b><br>Asst. Professor, Department of Mathematics,<br>GFGC Yelahanka,<br><a href="mailto:lathadevipuli@gmail.com">lathadevipuli@gmail.com</a> 9448259415  | Mathematics -<br>External Member |           |

|    |   |                                  |  |
|----|---|----------------------------------|--|
| 10 | <b>Prof. Sunil Kumar M</b><br>Assistant Professor, Department of Computer Science, T John Institute of Technology, Gottigere, Bangalore.<br><a href="mailto:sunilkumarm@tjohngroup.com">sunilkumarm@tjohngroup.com</a> ; 9902020775 | Computer Science-External Member |  |
| 11 | <b>Prof. Prasanna Kumar R B</b><br>Assistant Professor,<br>Department of Computer Science<br>REVA University<br><a href="mailto:prasannakumarrb@reva.edu.in">prasannakumarrb@reva.edu.in</a> 9342203018                             | Computer Science-Internal Member |  |
| 12 | <b>Prof. Tejaswini N</b><br>Assistant Professor,<br>Department of Computer Science,<br>REVA University<br><a href="mailto:tejaswini.n@reva.edu.in">tejaswini.n@reva.edu.in</a> 9742951008   | Computer Science-Internal Member |  |



## **B. Sc - Physics, Mathematics and Computer Science (PMCs) 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 19 years of age and government is committed to increase the GER to 30% by 2020, further necessitating a greater number of teachers and professors to work in schools and colleges. The proposed B.Sc. (PMCs) programme designed will act as a foundation and first degree to prepare teachers, 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. (PM Cs) programme at the School of Applied Sciences has been developed by the members of the faculty based on interactions with various universities, research establishments and industries in India and abroad.

The curriculum is outcome based and it imbibes required theoretical concepts and practical skills in the domain. By undergoing this programme, students develop critical, analytical thinking and problem-solving abilities for a smooth transition from academic to real-life work environment. In addition, students are trained in communication skills and interdisciplinary topics to enhance their scope. The above-mentioned features of the programme, advanced teaching and learning resources, and experience of the faculty members with their strong connections with industry and research organizations makes this programme unique.

### **Program Educational Objectives (PEO's)**

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

|       |   |
|-------|---|
| PEO-1 | Demonstrate problem solving skills in mathematics, Physics and computer science 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)**

Demonstrate the knowledge in the areas of mathematics, Physics, and computer science.

- PO 1. Apply the fundamentals of mathematics, Physics, and computer science to formulate, solve and interpret complex problems.
- PO 2. Comprehend, analyze, model and solve complex problems in the areas of mathematics, Physics and computer science.
- PO 3. Recognize the need to expertise in the areas of mathematics, Physics and computer science by self up gradation through lifelong learning.
- PO 4. Communicate with clarity and coherence, both written and verbally.
- PO 5. Exhibit professional and ethical responsibility.
- PO 6. Encourage collaborative learning through group activities and hands-on learning.
- PO 7. 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

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

## **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 **twohour session of T or P amounts to 1 credit per Semester** over a period of one Semester of 16 weeks for teaching-learning process.

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

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

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

**4.1.5.** Different **Courses of Study** are 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 **Open Elective Course.**

## 5. Eligibility for Admission:

5.1. The eligibility criteria for admission to B. Sc (PMCs) 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 |
| <b>Total</b>  | <b>192</b>      |

**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*

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

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 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 papers either internal or external examiner be called for setting the question paper to maintain an overall tally of 3 papers with the conditioned mentioned earlier. The internal examiner who sets the question paper should have been course tutor
- ii.* The Chairman of BoE shall get the question papers set by internal and external examiners.
- iii.* The Board of Examiners shall scrutinize and approve the question papers and scheme of valuation. It is the responsibility of the BoE to see that all questions contained in the question paper are within the prescribed syllabus of the concerned course.
- iv.* There shall be single valuation for all theory papers by internal examiners. However, there shall be moderation by the external examiner who has the subject background. In case no external examiner with subject background is available, a senior faculty member within the discipline shall be appointed as moderator.
- v.* The SEE examination for Practical work / Field work / Project work/Internship will be conducted jointly by internal and external examiners as detailed below: However, the BoE on its discretion can also permit two internal examiners.
- vi.* If a course is fully of (L=0):T:(P=0) type or a course is partly P type i.e, (L=3): (T=0) (P=1), then the examination for SEE component will be as decided by the BoS concerned.

I

**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        |
|     | <b>Total</b>  | <b>50 marks</b> |

**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        |
|     | <b>Total</b>  | <b>50 marks</b> |

**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:-**

- 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.
- 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 alongwith Sixth Semesters courses to earn B Sc Degree.
- e. Student "D" passed in 1to 4 semesters but failed in 3 courses of 5<sup>th</sup> Semester and in 1 course of 6<sup>th</sup> Semester. He / She has also passed all the courses of First to Fourth Semesters. Student "D" is also eligible to seek admission for 5<sup>th</sup> Semester and appear for C4 examination of 3 failed courses of 5<sup>th</sup> Semester concurrently with 5<sup>th</sup> Semester C4 examination and one failed course of 5<sup>th</sup> Semester concurrently with 6<sup>th</sup> 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<br>P | Grade<br>G | Grade Point<br>(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) =  $\sum(C_i \times G_i) / \sum C_i$**  where  $C_i$  is the number of credits of the  $i$ th course and  $G_i$  is the grade point scored by the student in the  $i$ th 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=19                        |
| Course 7 | 2      | O            | 10          | 2X10=20                       |
| Course 8 | 2      | A            | 8           | 2X8=16                        |
|          | 24     |              |             | 198                           |

Thus, **SGPA =  $198 \div 24 = 7.83$**

##### 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=19                              |
| 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 =  $175 \div 24 = 7.29$**

### Illustration No.3

| Course   | Credit | Grade Letter | Grade Point | Credit Point<br>(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 = 19                             |
| 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 = 19                             |
| Course 8 | 2      | A+           | 9           | 2 x 9 = 19                             |
|          | 24     |              |             | 199                                    |

Thus,  $SGPA = 199 \div 24 = 8.29$

#### 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 :  $CGPA = \frac{\sum(C_i \times S_i)}{\sum C_i}$

Where  $S_i$  is the SGPA of the  $i$ th semester and  $C_i$  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 (C <sub>i</sub> ) | SGPA (S <sub>i</sub> ) | Credits x SGPA (C <sub>i</sub> X S <sub>i</sub> ) |
|----------------|----------------------------------|------------------------|---|
| 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 = 219.88                                |
| 8              | 24                               | 9.25                   | 24 x 9.25 = 222                                   |
| Cumulative     | 196                              |                        | 1588.26   |

Thus,  $CGPA = \frac{24 \times 6.83 + 24 \times 7.29 + 24 \times 8.11 + 26 \times 7.40 + 26 \times 8.29 + 24 \times 8.58 + 24 \times 9.12 + 24 \times 9.25}{196} = 8.10$

#### 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      |

**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-Chancellor shall be final.

**Mapping of Course Outcomes with programme Outcomes**

| <b>Course Code</b> | <b>POS/<br/>COs</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
|--------------------|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS1030          | 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    |
| <b>Course Code</b> | <b>POS / COS</b>    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS1040          | 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    |
| <b>Course Code</b> | <b>POS / COS</b>    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS1050          | CO1                 | 3   | 3   | 3   | 3   | 2   |     | 1   | 3   | 3    | 3    |
|                    | CO2                 | 3   | 3   | 3   | 3   | 2   |     | 3   | 3   | 3    | 3    |
|                    | CO3                 | 3   | 3   | 3   | 2   | 2   |     | 2   | 3   | 3    | 3    |
|                    | CO4                 | 3   | 3   | 3   | 2   | 2   |     |     |     | 2    | 2    |
| <b>Course Code</b> | <b>POS / COS</b>    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS1060          | CO1                 |     |     |     |     |     | 1   |     |     |      |      |
|                    | CO2                 |     |     |     |     |     | 1   |     |     |      |      |
|                    | CO3                 |     |     |     |     |     | 1   |     |     |      |      |
|                    | CO4                 |     |     |     |     |     | 1   |     |     |      |      |
| <b>Course Code</b> | <b>POS / COS</b>    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS2030          | 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    |
| <b>Course Code</b> | <b>POS / COS</b>    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS2040          | CO1                 | 3   | 2   | 2   |     |     |     |     |     | 3    | 2    |
|                    | CO2                 | 2   | 2   | 2   |     |     |     |     |     | 3    | 3    |
|                    | CO3                 | 3   | 2   | 2   |     |     |     |     |     | 3    | 3    |
|                    | CO4                 | 3   | 2   | 2   |     |     |     |     |     | 3    | 2    |
| <b>Course Code</b> | <b>POS/<br/>Cos</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS2050          | CO1                 | 3   | 3   | 3   | 3   | 2   |     | 2   | 3   | 3    | 3    |
|                    | CO2                 | 3   | 3   | 3   | 2   |     |     |     | 3   | 3    | 3    |
|                    | CO3                 | 3   | 3   | 3   | 3   | 2   |     | 2   | 3   | 3    | 2    |
|                    | CO4                 | 3   | 3   | 3   | 2   |     |     | 2   | 2   | 3    | 2    |
| <b>Course Code</b> | <b>POS / COS</b>    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS2060          | 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    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS3030          | 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    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS3040          | 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    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS3050          | CO1              | 3   | 3   | 3   | 2   |     |     |     | 3   | 2    | 3    |
|                    | CO2              | 3   | 3   | 2   | 2   |     |     | 2   | 2   | 3    | 2    |
|                    | CO3              | 3   | 3   | 2   | 2   |     |     | 2   |     | 3    | 3    |
|                    | CO4              | 3   | 3   | 3   | 2   |     |     | 2   | 3   | 3    | 2    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS3061          | 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    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS4030          | 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    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS4040          | 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    |
|                    | CO5              | 3   | 3   | 3   | 3   |     |     | 1   | 3   | 3    | 3    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
|                    | CO1              | 3   | 3   | 3   |     |     |     | 1   | 2   | 3    | 3    |

|                    |                  |     |     |     |     |     |     |     |     |      |      |
|--------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS4050          | CO2              | 3   | 3   | 2   | 2   |     |     |     | 2   | 3    | 1    |
|                    | CO3              | 3   | 2   | 2   | 1   |     |     | 1   | 1   | 3    | 2    |
|                    | CO4              | 3   | 2   | 2   | 2   |     |     | 2   | 2   | 3    | 2    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS5010          | 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    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS5020          | 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    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS5030          | 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    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS5040          | CO1              | 3   | 2   | 3   | 2   | 3   | 1   |     | 2   | 3    | 3    |
|                    | CO2              | 2   | 1   | 3   | 1   | 2   |     | 2   | 3   | 3    | 2    |
|                    | CO3              | 2   | 1   | 3   |     | 1   |     | 3   | 1   | 2    | 3    |
|                    | CO4              | 2   | 2   | 3   | 3   | 3   | 1   | 1   |     | 3    | 1    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS6010          | 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    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |
| B19PS6020          | 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    |
| <b>Course Code</b> | <b>POS / COS</b> | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PS01 | PS02 |

|           |     |   |   |   |   |   |   |   |   |   |   |
|-----------|-----|---|---|---|---|---|---|---|---|---|---|
| B19PS6030 | CO1 | 3 | 2 | 3 | 1 |   |   |   |   | 3 | 2 |
|           | CO2 | 2 | 2 | 3 | 1 |   |   | 3 | 2 | 2 | 3 |
|           | CO3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 3 |
|           | CO4 | 2 | 2 | 3 | 3 |   |   | 3 |   | 3 | 2 |

### 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 & Computer Science (PMCs)

### Program

### Scheme Instruction and Detailed Syllabus

(Effective from the Academic Year 2019-22)

#### Scheme of Instruction

Duration: 6 Semesters (3 Years)

| Sl No                  | Course Code | Title of the Course                         | HC/SC/SE/CC | Credit Pattern |          |          |           | Hours     |
|------------------------|-------------|---|-------------|----------------|----------|----------|-----------|-----------|
|                        |             |   |             | L              | T        | P        | Total     |           |
| <b>FIRST SEMESTER</b>  |             |   |             |                |          |          |           |           |
| 1                      | B19PS1011   | Language – II: Kannada                      | CC          | 2              | 1        | 0        | 3         | 4         |
| 2                      | B19PS1012   | Language – II: Hindi                        | CC          |                |          |          |           |           |
| 3                      | B19PS1013   | Language – II: Additional English           | CC          |                |          |          |           |           |
| 4                      | B19PS1020   | Functional English - I                      | CC          | 2              | 1        | 0        | 3         | 4         |
| 5                      | B19PS1030   | Mechanics and Fluid Dynamics                | HC          | 2              | 1        | 0        | 3         | 4         |
| 6                      | B19PS1040   | Mathematics - I                             | HC          | 2              | 1        | 0        | 3         | 4         |
| 7                      | B19PS1050   | Problem Solving Techniques                  | HC          | 2              | 1        | 0        | 3         | 4         |
| 8                      | B19PS1060   | Constitution of India / Professional Ethics | FC          | 2              | 0        | 0        | 2         | 2         |
|                        |             | <i>Practicals</i>                           |             |                |          |          |           |           |
| 9                      | B19PS1070   | Physics Lab-I                               | HC          | 0              | 0        | 2        | 2         | 3         |
| 10                     | B19PS1080   | Mathematics Lab - I                         | HC          | 0              | 0        | 2        | 2         | 3         |
| 11                     | B19PS1090   | C Programming Lab                           | HC          | 0              | 0        | 2        | 2         | 3         |
| <b>Total Credits</b>   |             |   |             | <b>12</b>      | <b>5</b> | <b>6</b> | <b>23</b> | <b>31</b> |
| <b>SECOND SEMESTER</b> |             |   |             |                |          |          |           |           |
| 1                      | B19PS2011   | Language – II: Kannada                      | CC          |                |          |          |           |           |

|                      |           |                                   |      |           |          |          |           |           |
|----------------------|-----------|-----------------------------------|------|-----------|----------|----------|-----------|-----------|
| 2                    | B19PS2012 | Language – II: Hindi              | CC   | 2         | 1        | 0        | 3         | 4         |
| 3                    | B19PS2013 | Language – II: Additional English | CC   |           |          |          |           |           |
| 4                    | B19PS2020 | Functional English - II           | CC   | 2         | 1        | 0        | 3         | 4         |
| 5                    | B19PS2030 | Heat and Thermodynamics           | HC   | 2         | 1        | 0        | 3         | 4         |
| 6                    | B19PS2040 | Mathematics - II                  | HC   | 2         | 1        | 0        | 3         | 4         |
| 7                    | B19PS2050 | Data Structures Using C           | HC   | 2         | 1        | 0        | 3         | 4         |
| 8                    | B19PS2060 | Environmental Studies             | FC   | 2         | 0        | 0        | 2         | 2         |
| 9                    | B19PS2070 | Sports/Yoga/music/dance/theatr    | RULO | 2         | 0        | 0        | 2         | 2         |
|                      |           | <b>Practicals</b>                 |      |           |          |          |           |           |
| 10                   | B19PS2080 | Physics Lab-II                    | HC   | 0         | 0        | 2        | 2         | 3         |
| 11                   | B19PS2090 | Mathematics Lab - II              | HC   | 0         | 0        | 2        | 2         | 3         |
| 12                   | B19PS2X10 | Data Structures Lab               | HC   | 0         | 0        | 2        | 2         | 3         |
| <b>Total Credits</b> |           |                                   |      | <b>14</b> | <b>5</b> | <b>6</b> | <b>25</b> | <b>33</b> |

| <b>THIRD SEMESTER</b>  |           |  |      |           |          |          |           |           |
|------------------------|-----------|--|------|-----------|----------|----------|-----------|-----------|
| 1                      | B19PS3011 | Language – II: Kannada                       | CC   | 2         | 1        | 0        | 3         | 4         |
| 2                      | B19PS3012 | Language – II: Hindi                         | CC   |           |          |          |           |           |
| 3                      | B19PS3013 | Language – II: Additional English            | CC   |           |          |          |           |           |
| 4                      | B19PS3020 | Communicative English - I                    | CC   | 2         | 1        | 0        | 3         | 4         |
| 5                      | B19PS3030 | Waves and optics                             | HC   | 2         | 1        | 0        | 3         | 4         |
| 6                      | B19PS3040 | Mathematics-III                              | HC   | 2         | 1        | 0        | 3         | 4         |
|                        | B19PS3050 | RDBMS  | HC   | 2         | 1        | 0        | 3         | 4         |
| 8                      | B19PS3061 | Physics in Everyday life                     | OE   | 4         | 0        | 0        | 4         | 4         |
| 9                      | B19PS3062 | Classical Optimization                       | OE   |           |          |          |           |           |
|                        |           | <b>Practicals</b>                            |      |           |          |          |           |           |
| 10                     | B19PS3070 | Physics Lab -III                             | HC   | 0         | 0        | 2        | 2         | 3         |
| 11                     | B19PS3080 | Mathematics Lab - III                        | HC   | 0         | 0        | 2        | 2         | 3         |
| 13                     | B19PS3X20 | RDBMS Lab                                    | HC   | 0         | 0        | 2        | 2         | 3         |
| <b>Total Credits</b>   |           |  |      | <b>16</b> | <b>4</b> | <b>6</b> | <b>25</b> | <b>33</b> |
| <b>FOURTH SEMESTER</b> |           |  |      |           |          |          |           |           |
| 1                      | B19PS4011 | Language – II: Kannada                       | CC   | 2         | 1        | 0        | 3         | 4         |
| 2                      | B19PS4012 | Language – II: Hindi                         | CC   |           |          |          |           |           |
| 3                      | B19PS4013 | Language – II: Additional English            | CC   |           |          |          |           |           |
| 4                      | B19PS4020 | Communicative English - II                   | CC   | 2         | 1        | 0        | 3         | 4         |
| 5                      | B19PS4030 | Electricity and Magnetism                    | HC   | 2         | 1        | 0        | 3         | 4         |
| 6                      | B19PS4040 | Mathematics - IV                             | HC   | 2         | 1        | 0        | 3         | 4         |
| 7                      | B19PS4050 | Operating System & Shell Program Using LINUX | HC   | 2         | 1        | 0        | 3         | 4         |
| 8                      | B19PS4060 | Soft Skill Training                          | RULO | 1         | 1        | 0        | 2         | 3         |
|                        |           | <b>Practicals</b>                            |      |           |          |          |           |           |
| 9                      | B19PS4070 | Physics Lab -IV                              | HC   | 0         | 0        | 2        | 2         | 3         |
| 10                     | B19PS4080 | Mathematics Lab - IV                         | HC   | 0         | 0        | 2        | 2         | 3         |
| 11                     | B19PS4090 | LINUX Lab                                    | HC   | 0         | 0        | 2        | 2         | 3         |
| <b>Total Credits</b>   |           |  |      | <b>11</b> | <b>6</b> | <b>6</b> | <b>23</b> | <b>32</b> |
| <b>FIFTH SEMESTER</b>  |           |  |      |           |          |          |           |           |
| 1                      | B19PS5010 | Quantum Mechanics                            | HC   | 1         | 1        | 0        | 2         | 3         |
| 2                      | B19PS5020 | Mathematics - V                              | HC   | 1         | 1        | 0        | 2         | 3         |
| 3                      | B19PS5030 | Mathematics - VI                             | HC   | 1         | 1        | 0        | 2         | 3         |
| 4                      | B19PS5040 | JAVA Programing                              | HC   | 1         | 1        | 0        | 2         | 3         |
|                        | B19PS5061 | Renewable Energy Resource                    | SC   | 2         | 0        | 0        | 2         | 2         |
|                        | B19PS5062 | Solid State Physics                          |      |           |          |          |           |           |
|                        | B19PS5063 | Semiconductor Physics                        |      |           |          |          |           |           |
| 7                      | B19PS5071 | Complex Analysis                             | SC   | 2         | 0        | 0        | 2         | 2         |
|                        | B19PS5072 | Fluid Dynamics                               |      |           |          |          |           |           |
|                        | B19PS5073 | Number Theory                                |      |           |          |          |           |           |

|                       |           |   |          |           |          |                |                 |                 |
|-----------------------|-----------|---|----------|-----------|----------|----------------|-----------------|-----------------|
| 8                     | B19PS5081 | Web Programming   | SC       | 2         | 0        | 0              | 2               | 2               |
|                       | B19PS5082 | Visual Programming  |          |           |          |                |                 |                 |
|                       | B19PS5083 | Computer Graphics   |          |           |          |                |                 |                 |
| 9                     | B19PS5090 | Soft Skill Training   | RUL<br>O | 1         | 1        | 0              | 2               | 3               |
|                       |           | <b>Practicals</b>   |          |           |          |                |                 |                 |
| 1<br>0                | B19PS5X10 | Physics Lab – V   | HC       | 0         | 0        | 2              | 2               | 3               |
| 1<br>1                | B19PS5X20 | Physics Lab –VI   | HC       | 0         | 0        | 2              | 2               | 3               |
| 1<br>2                | B19PS5X40 | JAVA Programming Lab  | HC       | 0         | 0        | 2              | 2               | 3               |
| 1<br>3                | B19PS5X50 | Web Programming Lab /<br>Visual PProgramming<br>Lab/<br>Computer Graphics Lab | HC       | 0         | 0        | 2              | 2               | 3               |
|                       |           | <b>Total Credits</b>  |          | <b>12</b> | <b>6</b> | <b>1<br/>0</b> | <b>24</b>       | <b>39</b>       |
| <b>SIXTH SEMESTER</b> |           |   |          |           |          |                |                 |                 |
| 1                     | B19PS6010 | Nuclear Physics -   | HC       | 1         | 1        | 0              | 2               | 3               |
| 2                     | B19PS6020 | Numerical Methods   | HC       | 1         | 1        | 0              | 2               | 3               |
| 3                     | B19PS6030 | Software Engineering  | HC       | 1         | 1        | 0              | 2               | 3               |
| 4                     | B19PS6041 | Physics of Clouds   | SC       | 2         | 0        | 0              | 2               | 2               |
|                       | B19PS6042 | Astro Physics   |          |           |          |                |                 |                 |
|                       | B19PS6043 | Digital Electronics<br>andCommunication                                       |          |           |          |                |                 |                 |
| 5                     | B19PS6051 | Fuzzy Mathematics   | SC       | 2         | 0        | 0              | 2               | 2               |
|                       | B19PS6052 | Topology  |          |           |          |                |                 |                 |
|                       | B19PS6053 | Discrete Mathematics and<br>Graph Theory                                      |          |           |          |                |                 |                 |
| 6                     | B19PS6061 | Computer Networks   | SC       | 2         | 0        | 0              | 2               | 2               |
|                       | B19PS6062 | Design and<br>Analysis of<br>Algorithms                                       |          |           |          |                |                 |                 |
|                       | B19PS6063 | Computer Architecture   |          |           |          |                |                 |                 |
| 7                     | B19PS6070 | MOOC/SWAYAM/Interns<br>hip  | RUL<br>O | 0         | 0        | 2              | 2               | 3               |
| 8                     | B19PS6080 | Soft Skill Training   | RUL<br>O | 1         | 1        | 0              | 2               | 3               |
|                       |           | <b>Practicals</b>   |          |           |          |                |                 |                 |
| 9                     | B19PS6090 | Physics Lab – VII   | HC       | 0         | 0        | 2              | 2               | 3               |
| 1<br>0                | B19PS6X10 | Mathematics Lab - V   | HC       | 0         | 0        | 2              | 2               | 3               |
| 1<br>1                | B19PS6X20 | Numerical Methods - Lab   | HC       | 0         | 0        | 2              | 2               | 3               |
| 1<br>2                | B19PS6X30 | Computer Science Project  | HC       | 0         | 0        | 2              | 2               | 3               |
|                       |           | <b>Total Credits</b>  |          | <b>10</b> | <b>4</b> | <b>1<br/>2</b> | <b>24</b>       | <b>36</b>       |
|                       |           | <b>Total Credits of all<br/>Semesters</b>                                     |          |           |          |                | <b>14<br/>4</b> | <b>19<br/>5</b> |

**Distribution of credits – L: T: P**

| <b>Sem</b>   | <b>L</b>  | <b>T</b>  | <b>P</b>  | <b>Total</b> |
|--------------|-----------|-----------|-----------|--------------|
| I            | 12        | 05        | 06        | 23           |
| II           | 14        | 05        | 06        | 25           |
| III          | 16        | 04        | 06        | 25           |
| IV           | 11        | 06        | 06        | 23           |
| V            | 12        | 10        | 10        | 24           |
| VI           | 10        | 04        | 12        | 24           |
| <b>Total</b> | <b>75</b> | <b>34</b> | <b>46</b> | <b>144</b>   |





|  |            |  |  |  |  |  |          |          |          |  |  |
|--|------------|--|--|--|--|--|----------|----------|----------|--|--|
|  | <b>CO3</b> |  |  |  |  |  | <b>3</b> |          |          |  |  |
|  | <b>CO4</b> |  |  |  |  |  |          | <b>3</b> | <b>2</b> |  |  |

**Course Contents:**

**Unit-I: 12 Hrs**

1. uAvAvAvÉ °ÀqÉzAv - dÉÀÏzÀ VAvÉ
2. ÉÉ@uAAUÉ ǫÉAB vAPAZÉs/É - ÏAAÏÀ
3. PAAqAA ZAAÏÉ dÏzÀ vAAÏAAA - ÉÁUAvAvAAð
4. avAAvAAÏÁv gAvAAVÉ ÉÁj - dÉAB

**Unit-II: 12 Hrs**

1. C@AiAAAvÉsvÉÄð PÁ@vÁ±ÀçA vAAgAAzÉAiAAA zAAIzÉÁ... - ÉÁUÀZAAzAæ
2. vAZÁÉAUAvAA - CPAvAA°ÁzÉÁ«
3. vAZÁÉAUAvAA - šuvAtÚ
4. UAAqAAiAAæÀ gAUAvÉ - °Áj°ÁgÀ

**Unit-III: 12 Hrs**

1. zAAuAÖšÄçAiAAA zAvAAðšÄçAiAAA - zAAUÀð¹A°À
2. PÁeArAiAA PÉsAt - vAiA¹Ú
3. AiAiÁgAs CjAiAAzÀ «ÁgÀ - PAAvEAÏAA
4. uAvAAuEiAA vAAUAA - wvÉÁtÂ

**Unit-IV: 12 Hrs**

1. mÉs¼AAUÀnÖ- n.!. PÉÉeÁuAA

**ÏÁgAA±Áðñ UAxÁUAvAA:**

1. vAAUAA½ gAA.²æ., PÁÉÁqÀ uÁ»vÁ ZÁjv, ÏÁePÁ±APÁgAA VAvÁ šAPi °Éuī, vÉÉUÀsgAA. 2014
2. uAAUÁeª. ÉÁUÉAUËqÀ JZi.Jeī., ZÁjv dÉÀÏzÀ PÁxÁÉÁ PÁvÁUAvAA, ÏÁePÁ±APÁgAA PÁÉÁðI PÁ eÁÉÀÏzÀ ÏÁjµAvAAU, vÉÉUÀsgAA. 2008
3. ¹AvAiÁwAvÁ PÁÉÁqÀ uÁ»vÁ ZÁjv uAAÏAAI 1,2,3,4,5 vAAvAAU 6, PAAvEAÏAA PÁÉÁqÀ CzšAiAAÉÁ uAAuÉU, vÉÉUÀsgAA «±Áé«zÁâ@AiAA, vÉÉUÀsgAA. 2014
4. uAAUÁeª. ÉÁUÉAUËqÀ JZi.Jeī., PÁÉÁqÀ dÉÀÏzÀ PÁxÁÉÁ PÁvÁUAvAA, ÏÁePÁ±APÁgAA PÁÉÁðI PÁ eÁÉÀÏzÀ ÏÁjµAvAAU, vÉÉUÀsgAA. 2007
5. °AAÏ ÉÁUÁgÁdAiAA, uAAUAvAA PÁ«UAvAA, ÏÁePÁ±APÁgAA uÁçÁð šAPi °Éuī, vÉÉUÀsgAA. 2010
6. ÉÁgAAiAA t !,«, ZAAÏAs PÁ«UAvAA, ÏÁePÁ±APÁgAA uÁçÁð šAPi °Éuī, vÉÉUÀsgAA. 2010
7. PÁvÉAUËqÀ ÉÁUAvÁgÁ, wvÁç, gAUAvÉ vAAvAAU eÁÉÀÏzÀ uÁ»vÁ, ÏÁePÁ±APÁgAA uÁçÁð šAPi °Éuī, vÉÉUÀsgAA. 2010
8. uAA. vÉÉUÁeī gAvAA gAvī vAAvAAU ÏÁÉÁÁA uAAAZÁgÀ ±Á¹Ï ÏÁÁgAt ÉAvAA ZÁsqAvAAÏÁ ÏÁePÁ±APÁgAA ÏÁmÁgAAUÁ, vÉÉUÀsgAA «±Áé«zÁâ@AiAA. 2010

9. qÁ. azÁfAAZá vAAswð, vAZÁÉÁ uÁ»vÁ, ¥ÁePÁ±APÁgÁÁ uÁePÁB §ÄPí °Ëüi, °ÉAUÁ%ÁsgÁÁ. 2013
10. uÁÁ. §uÁvÁgÁdÁ Jeï. uÁvÁððÓÉÁ vAZÁÉÁUÁ%ÁÁ, ¥ÁePÁ±APÁgÁÁ VÁvÁ §ÄPí °Ëüi, vÉÁÉuÁsgÁÁ. 2012
11. uÁÁ. §uÁvÁgÁdÁ Jeï. CPÁÉÁ vAZÁÉÁUÁ%ÁÁ, ¥ÁePÁ±APÁgÁÁ VÁvÁ §ÄPí °Ëüi, vÉÁÉuÁsgÁÁ. 1997
12. uÁÁ vÁÁgÁÁ%Á¹zÁ¥Á PÉ, £ÁUÁgÁd Q.gÁÁ. vAZÁÉÁ PÁvÁÁI, ¥ÁePÁ±APÁgÁÁ uÁePÁB §ÄPí °Ëüi, °ÉAUÁ%ÁsgÁÁ. 2016
13. £ÁgÁ¹A°ÁZÁgí. r.Jeï., ¥ÁÁ¥Á °ÁgÁvÁ ÇÁ;PÉ, ¥ÁePÁ±APÁgÁÁ r.«.PÉ vAAswð ¥ÁePÁ±ÁÉÁ, vÉÁÉuÁsgÁÁ. 2012
14. gÁAeÁfí zÁUÁD, ±ÁgÁtgÁ uÁvÁÁUÁePÁAw, ¥ÁePÁ±APÁgÁÁ. eÉsÁ»AiÁiÁ ¥ÁePÁ±ÁÉÁ, §¼Áij. 2015
15. zÉÁ±Á¥ÁÁqÉ Juï.Jeï. °ÉÁAzÉe ±ÁjÁ¥ÁgÁ PÁvÁÁAiÁiÁÉÁ, ¥ÁePÁ±APÁgÁÁ zÉÁ¹ ¥ÁÁuÁÁU, °ÉAUÁ%ÁsgÁÁ. 2013
16. uÁÁ. ©.Juï. PÉÁ±ÁvÁgÁví. PÉÉeÁuÁÁ PÁÉÁBqÁ £ÁIPAUÁ%ÁÁ, ¥ÁePÁ±APÁgÁÁ CAQvÁ ¥ÁÁuÁPÁ, °ÉAUÁ%ÁsgÁÁ. 2005
17. ±ÁvÁÁgÁÁiÁÁ vÁuÁÁ, PÁÉÁBqÁ uÁ»vÁ ZÁjvÉ, ¥ÁePÁ±APÁgÁÁ vÁÁÁQÉÁ vÉAPÁtÚAiÁÁÁ uÁÁgÁPÁ UÁeAxÁvÁiÁeÉ, vÉÁÉuÁsgÁÁ -2014²vÁgÁÁzÁeÁhí f.Juï. PÁÉÁBqÁ uÁ»vÁ uÁ«ÁÁPÉÉ, ¥ÁePÁ±APÁgÁÁ uÁePÁB §ÄPí °Ëüi, °ÉAUÁ%ÁsgÁÁ. 2013

|                        |                   |          |          |          |          |
|------------------------|-------------------|----------|----------|----------|----------|
| <b>B19PS1012</b>       | <b>Hindi - II</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                   | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**Prerequisites:**

यह पाठ्यक्रम नौमिमात्रिका, अपनी भाषणा की धरता का निकाणि करने हुतुवथा नमिभर मिाहसयक म्भुयाओं द्वारा मिमाज, अकृष्य एिंजिीन के म्भुयों को मिमदने हुतु असमकमपत है।

**Course Objectives:**

- मिंदमात्रिका उमति भाषणा का एयोग करने की दशता को छुाफने में उयात्र करना |
- मिाहसय के म्भुयम एिंमिमाज एिंमिानिीय म्भुयों को मिमदनाकर, उन म्भुयों की रसा हुतुंरत करना |
- छुाफने में म्भुयक पठन एिंजिीन की अकृष्यतम म्भुयि स्यापत करना |
- वध्थेताओं में मिाहसय के म्भुयम मिे म्भुयि एिंकुष्यल मिीधर का निकाणि करना |

**Course Outcomes:**

**असिगम पररणाम :**

वध्थयन की मिमात्रिका पर अयेवेता –

- मिमात्रिका म्भुय एिंकेसक जिीवदही को म्भुयिकार कर िकता है।
- मिाहसय की म्भुयिकता को जिीन में मिमदने की रसा रितता है।
- मिमात्रिका में अंमिहत म्भुयमिे एिंजिीन मिीधर का व्भुयन करने में मिम वन िकता है।

## Mapping of Course Outcomes with programme Outcomes

| Course Code | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS1012   | CO1     |     |     |     |     | 2   | 3   | 2   |     |      |      |
|             | CO2     |     |     |     |     | 2   | 2   | 3   |     |      |      |
|             | CO3     |     |     |     |     | 3   | 3   | 3   |     |      |      |
|             | CO4     |     |     |     |     | 3   | 2   | 3   |     |      |      |

### Course Contents:

#### अध्ययन सिषय ििी / पाठ्यक्रम

#### इकाई – 1: कहानी, िंमरण

12 hrs. 1. कहानी - नशा - प्रेमिंद

2. कहानी - ििुमय जींन - ि/ िर शमांनुरी

3. िंमरण - शरत कऱिथ नवतणु कुछ िमय - अतलाल नागर

#### अध्यापन िसऱियाँ:

#### इकाई – 2: कहानी, आगमकथन

12 hrs. 4. कहानी - मले िपहले भूम िहती

5. कहानी - लणल हऱिनी - शशऱिनी

6. आगमकथन - जल- जींन की झलक - गणेश शंकर िऱायी

#### अध्यापन िसऱियाँ:

#### इकाई – 3: कहानी, कथन रऱिना

12 hrs. 7. कहानी - िणय का एक िणालण - कैथरीन सऱिफऱीड

8. कथन रऱिना - भेऱे और भंडऱे - हरशंकर िरऱिई

#### अध्यापन िसऱियाँ:

#### इकाई – 4: अनऱुऱिद, िंमरण

#### अध्यापन िसऱियाँ: 12 hrs.

अन ाद : अणुऱुऱी - सही (शब्द िंअऱुऱेक) िण : िरऱुऱेक

ि का एक सतहऱई िणग िे |

कं

## विन्दभाग्रन्थ :

- पाठ्य पुस्तक - रेखिण मन्त्रिणालय
- विद्योति विहारक मन्दी - डॉ. कुलदीप गणु
- असमन्ति विहारक मन्दी - डॉ. परमानन्द गणु
- मन्दी विमहय का इतहासि - डॉ. नाग
- आदिमनक मन्दी विमहय का इतहासि - डॉ. बन्त मन्दि
- मन्दी विमहय का निरन इतहासि - डॉ. लणल विहब मन्दि
- मन्दी के विबले के कलि विनिनाथ पाडे
- कवयालय अनुविद मन्देशका
- विनिष और पालनि - के. वि. भणवियण&तुमन मनि

**विनिः** पणठ ३. गणम और ६. मन्तलणः एक आकणत वमियि के मणत पर ३. शरत के विथ मवतायण हुआ कुल्ल विमय और ६. जल जणनि की झलक पणठ को विन करके पणव्रम रे विणोनि कयण गयण है

|                        |                                |          |          |          |          |
|------------------------|--------------------------------|----------|----------|----------|----------|
| <b>B19PS1013</b>       | <b>Additional English - II</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                                | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

### 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

1. Demonstrate ethical responsibilities in taking cognizance of issues relating to society and 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/<br>COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS1013</b> | <b>CO1</b>  |     |     |     |     | 3   | 3   | 3   | 2   |      |      |
|                  | <b>CO2</b>  |     |     |     |     | 3   | 3   | 3   | 3   |      |      |
|                  | <b>CO3</b>  |     |     |     |     | 3   | 3   | 3   | 2   |      |      |
|                  | <b>CO4</b>  |     |     |     |     | 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**

**12Hrs**

**Literature:** John Keats – La Belle Dame Sans Merci Charles Dickens – The Signal Man  
Hans Christian Anderson - The Fir Tree William 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 Sweetest Rupert Brooke – Success  
Dr. Martin Luther King - I Have a Dream Helen Keller – Excerpt from *The Story of My Life*

**Writing Skills:** Brochure & Leaflet

**Reference Books:**

1. Tagore, Rabindranath. *Gitanjali*. 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, ArunKolatkhar, 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, HistoricalPrints 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

|                         |                               |          |          |          |          |
|-------------------------|-------------------------------|----------|----------|----------|----------|
| <b>B19PS1020</b>        | <b>Functional English - I</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14 Wks</b> |                               | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**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 (ReadingSkills).
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/<br>COs | PO1 | PO2 | PO3 | PO4 | PO5      | PO6      | PO7      | PO8      | PSO1 | PSO2 |
|------------------|-------------|-----|-----|-----|-----|----------|----------|----------|----------|------|------|
| <b>B19PS1020</b> | <b>CO1</b>  |     |     |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>1</b> |      |      |
|                  | <b>CO2</b>  |     |     |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |      |      |
|                  | <b>CO3</b>  |     |     |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |      |      |
|                  | <b>CO4</b>  |     |     |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>1</b> |      |      |

#### 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.

|                         |                                     |          |          |          |          |
|-------------------------|-------------------------------------|----------|----------|----------|----------|
| <b>B19PS1030</b>        | <b>Mechanics and Fluid Dynamics</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14 Wks</b> |                                     | <b>2</b> | <b>0</b> | <b>1</b> | <b>3</b> |

**Prerequisites:**

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 ascertain 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     |
|------------------|------------|----------|----------|----------|----------|----------|-----|-----|-----|----------|----------|
| <b>B19PS1030</b> | <b>CO1</b> | <b>3</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>1</b> |     |     |     | <b>3</b> | <b>2</b> |
|                  | <b>CO2</b> | <b>3</b> | <b>3</b> | <b>2</b> | <b>1</b> |          |     |     |     | <b>3</b> | <b>2</b> |
|                  | <b>CO3</b> | <b>3</b> | <b>2</b> | <b>2</b> | <b>1</b> | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>1</b> |          |     |     |     | <b>3</b> | <b>2</b> |

#### 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 PrakashNath & Co., Meerut

#### Reference Books:

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

|                        |               |   |   |   |   |
|------------------------|---------------|---|---|---|---|
| B19PS1030              | Mathematics-I | L | T | P | C |
| <b>Duration:14 Wks</b> |               | 2 | 1 | 0 | 3 |

**Prerequisites:**

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

**Course Objectives:**

1. Familiarize the concepts of matrix and its applications in various fields.
2. Understand the concepts of successive differentiation and  $n^{\text{th}}$  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  $n^{\text{th}}$  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 |
|-------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS1030   | 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,  $n^{\text{th}}$  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

$$\int \sin^n x dx, \int \cos^n x dx, \int \tan^n x dx, \int \cot^n x dx, \int \sec^n x dx, \int \csc^n x dx \text{ \& } \int \sin^m x \cos^n x dx, \quad \text{with}$$

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. Krishnamoorthy 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.

|                        |   |          |          |          |          |
|------------------------|---|----------|----------|----------|----------|
| <b>B19PS1050</b>       | <b>Problem Solving Techniques using C</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |   | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

#### Course Outline:

Formulate simple algorithms for arithmetic and logical problems, Test and execute the programs and correct syntax and logical errors, implement conditional branching, iteration and recursion, apply programming to solve simple numerical method problems.

#### Course Objectives:

The objectives of this course are to:

1. To gain experience about structured programming
2. To familiarize students to use C language
3. To understand various features in C language
4. Create the solutions for various Real-world Problems

#### Course Outcomes:

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

1. write algorithms and to draw flowcharts for solving problems.
2. convert the algorithms/flowcharts to C programs
3. code and test a given logic in C programming language
4. decompose a problem into functions and to develop modular Reusable code

| Course Code   | POS/COs    | PO1      | PO2      | PO3      | PO4      | PO5      | PO6 | PO7      | PO8      | PSO1     | PSO2     |
|---------------|------------|----------|----------|----------|----------|----------|-----|----------|----------|----------|----------|
| B19PS<br>1050 | <b>CO1</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |     | <b>1</b> | <b>3</b> | <b>3</b> | <b>3</b> |
|               | <b>CO2</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |
|               | <b>CO3</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> | <b>2</b> |     | <b>2</b> | <b>3</b> | <b>3</b> | <b>3</b> |
|               | <b>CO4</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> | <b>2</b> |     |          |          | <b>2</b> | <b>2</b> |

#### Mapping of Course Outcomes with programme Outcomes

## Course Contents

### UNIT-I

12 Hrs

Introduction to Programming Concepts: Software, Classification of Software, Modular Programming, Structured Programming, Algorithms and Flowcharts with examples. Overview of C Language: History of C, Character set, C tokens, Identifiers, Keywords, Data types, Variables, Constants, Symbolic Constants, Operators in C, Hierarchy of Operators, Expressions, Type Conversions and Library Functions.

### UNIT-II

12 Hrs

Managing Input and Output Operation: Formatted and Unformatted I/O Functions  
decision making, branching and looping: Decision Making Statements - if Statement, if-else statement, nesting of if-else statements, else-if ladder, switch statement, ?: operator, Looping - while, do-while, for loop, Nested loop, break, continue, and goto statements. Functions: Function Definition, prototyping, types of functions, passing arguments to functions, Nested Functions, Recursive functions.

### UNIT-III

12 Hrs

Arrays: Declaring and Initializing, One Dimensional Arrays, Two Dimensional Arrays, Multi-Dimensional Arrays - Passing arrays to functions. Strings: Declaring and Initializing strings, Operations on strings, Arrays of strings, passing strings to functions. Storage Classes - Automatic, External, Static and Register Variables. C Preprocessor directives, Macros – Definition, types of Macros, Creating and implementing user defined header files.

### UNIT-IV

12 Hrs

Structures - Declaring and Initializing, Nested structure, Array of Structure, Passing structures to functions, Unions, typedef, enum, Bit fields. Pointers – Declarations, Pointer arithmetic, Pointers and functions, Call by value, Call by reference, Pointers and Arrays, Arrays of Pointers, Pointers and Structures. Meaning of static and dynamic memory allocation, Memory allocation functions.

### Text Books:

1. Let us C - Y.Kanetka, BPB Publications
2. Programming in ANSI C - Balaguruswami, TMH
3. C The Complete Reference - H.Sohildt, TMH

**Reference Books:**

1. The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI
2. Programming in C - Gottfried B.S., TMH
3. A Structured Programming Approach using C – BA Forouzan & RF Gillberg, Thomson Indian Edn

|                         |  |          |          |          |          |
|-------------------------|--|----------|----------|----------|----------|
| <b>B19PS1060</b>        | <b>Indian Constitution &amp; Professional Ethics</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14 Wks</b> |  | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**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 follow 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 |
|------------------|------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS1040</b> | <b>CO1</b> |     |     |     |     |     |     |     |     |      |      |
|                  | <b>CO2</b> |     |     |     |     |     |     |     |     |      |      |

|  |            |  |  |  |  |  |  |  |  |  |  |
|--|------------|--|--|--|--|--|--|--|--|--|--|
|  | <b>CO3</b> |  |  |  |  |  |  |  |  |  |  |
|  | <b>CO4</b> |  |  |  |  |  |  |  |  |  |  |

|                       |
|-----------------------|
| <b>Course content</b> |
|-----------------------|

**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 Companies in 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

|                        |                       |          |          |          |          |
|------------------------|-----------------------|----------|----------|----------|----------|
| <b>B19PS1070</b>       | <b>Physics lab- I</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                       | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

|                       |
|-----------------------|
| <b>Prerequisites:</b> |
|-----------------------|



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/<br>COs | PO1      | PO2      | PO3      | PO4 | PO5      | PO6 | P7 | PO8 | PSO1     | PSO2     |
|------------------|-------------|----------|----------|----------|-----|----------|-----|----|-----|----------|----------|
| <b>B19PS1070</b> | <b>CO1</b>  | <b>3</b> | <b>2</b> | <b>2</b> |     | <b>1</b> |     |    |     | <b>3</b> | <b>3</b> |
|                  | <b>CO2</b>  | <b>3</b> | <b>2</b> | <b>2</b> |     | <b>1</b> |     |    |     | <b>3</b> | <b>3</b> |
|                  | <b>CO3</b>  | <b>2</b> | <b>2</b> | <b>2</b> |     | <b>1</b> |     |    |     | <b>2</b> | <b>3</b> |
|                  | <b>CO4</b>  | <b>3</b> | <b>2</b> | <b>2</b> |     | <b>1</b> |     |    |     | <b>3</b> | <b>2</b> |

### 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).

|                        |                   |   |   |   |   |
|------------------------|-------------------|---|---|---|---|
| B19PS1070              | Mathematics Lab-I | L | T | P | C |
| <b>Duration:14 Wks</b> |                   | 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 |
|-------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS1070   | 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 form and normal form.
5. Establishing consistency or otherwise and solving system of linear equations.
6. Introduction to *Maxima*
7. *Maxima* commands for derivatives and  $n^{\text{th}}$  derivatives.
8. Introduction to  $n^{\text{th}}$  derivative without Leibnitz rule.
9.  $n^{\text{th}}$  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

|                        |                          |          |          |          |          |
|------------------------|--------------------------|----------|----------|----------|----------|
| <b>B19PS1090</b>       |                          | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> | <b>C Programming Lab</b> | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

### Prerequisites:

The students must have basic knowledge of mathematical and algorithmic logics, to understand major control structures such as branching, loops and expressions, to be able to use functions and to create arrays of elementary objects in their simple C programs. The course teaching language is English, so students must have communication, reading and apprehension skills of English

### Course Objectives:

The objectives of this course are to:

1. To impart the knowledge of the concepts of algebra and its applications in various fields.
2. To equip with the concepts of solid geometry and its applications in various fields.
3. To understand the concepts of differential calculus and its applications.
4. To familiarize with the concepts of integral calculus and its applications.

### Course Outcomes:

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

1. Read, understand, and trace the execution of programs written in C language.
2. Write the C code for a given algorithm.
3. Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
4. Write programs that perform operations using derived data types.

### Mapping of Course Outcomes with programme Outcomes

| Course Code   | POS/COs    | PO1      | P2       | PO3      | PO4      | PO5 | PO6 | P7       | PO8      | PSO1     | PSO2     |
|---------------|------------|----------|----------|----------|----------|-----|-----|----------|----------|----------|----------|
| B19PS<br>1090 | <b>CO1</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |     |     | <b>2</b> | <b>3</b> | <b>3</b> | <b>2</b> |
|               | <b>CO2</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |     |     | <b>2</b> | <b>3</b> | <b>3</b> | <b>3</b> |
|               | <b>CO3</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |     |     | <b>2</b> | <b>3</b> | <b>3</b> | <b>3</b> |
|               | <b>CO4</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |     |     |          | <b>1</b> | <b>3</b> | <b>2</b> |

### Lab Experiments

- 1) Write a Program to find the roots of the given quadratic equation.
- 2) Write a C Program to generate and print first N Fibonacci numbers





5. °AAFA £AUAgÁdAiÁi, uÁAUvÁá PÁ«UÁ¼ÁÁ, ¥ÁPÁ=ÁPÁgÁÁ uÁçFÁB §ÁPi °Eui, °EAU¼ÁsgÁÁ. 2010
6. £ÁgÁAiÁ t |.«, ZÁAFAs PÁ«UÁ¼ÁÁ, ¥ÁPÁ=ÁPÁgÁÁ uÁçFÁB §ÁPi °Eui, °EAU¼ÁsgÁÁ. 2010
7. PÁ¼ÉÁUÉqÁ £ÁUAvÁgÁ, wæFAç, gÁUÁ¼É vÁAvÁÁÇÉ£Á¥ÁzÁ uÁ»vÁá, ¥ÁPÁ=ÁPÁgÁÁ uÁçFÁB §ÁPi °Eui, °EAU¼ÁsgÁÁ. 2010
8. uÁÁ. °ÉÁUÁEi gÁvÁÁ gÁvÁ vÁAvÁÁÇÉ£ÁÁÁ uÁÁAzÁgÁ ±Á¼¥ÁÁgÁt £AvÁÁ ZÁsqÁvÁÁtÁ, ¥ÁPÁ=ÁPÁgÁÁ ¥ÁæuÁgÁAUÁ, vÉÁEúÁsgÁÁ «±Áé«zÁÁ©ÁiÁÁ. 2010
9. qÁ. azÁ£ÁAzÁ vÁÁswð, vÁZÁtÁ uÁ»vÁá, ¥ÁPÁ=ÁPÁgÁÁ uÁçFÁB §ÁPi °Eui, °EAU¼ÁsgÁÁ. 2013
10. uÁÁ. §uÁvÁgÁdÁ Jei. uÁvÁÁðð vÁZÁ£ÁUÁ¼ÁÁ, ¥ÁPÁ=ÁPÁgÁÁ VÁvÁ §ÁPi °Eui, vÉÁEúÁsgÁÁ. 2012
11. uÁÁ. §uÁvÁgÁdÁ Jei. ÇPÁ£Á vÁZÁ£ÁUÁ¼ÁÁ, ¥ÁPÁ=ÁPÁgÁÁ VÁvÁ §ÁPi °Eui, vÉÁEúÁsgÁÁ. 1997
12. uÁÁ vÁÁgÁÁ¼Á¼Á zÁ¥ÁÁ PÉ, £ÁUÁgÁd Q.gÁÁ. vÁZÁtÁ PÁvÁÁäl, ¥ÁPÁ=ÁPÁgÁÁ uÁçFÁB §ÁPi °Eui, °EAU¼ÁsgÁÁ. 2016
13. £ÁgÁ¼ÁÁZÁgÁ. r.Jei, ¥ÁAFA °sÁgÁvÁ çÁ¼PÉ, ¥ÁPÁ=ÁPÁgÁÁ r.«.PÉ vÁÁswð ¥ÁPÁ=ÁtÁ, vÉÁEúÁsgÁÁ. 2012
14. gÁAeÁtÁ zÁUÁð, ±ÁgÁtÁgÁ uÁvÁÁ¼Á PÁæAw, ¥ÁPÁ=ÁPÁgÁÁ. eÉsÁ»AiÁ¼Á ¥ÁPÁ=ÁtÁ, §¼Áj. 2015
15. zÉÁ±Á¥ÁÁqÉ Juí.Jei. °ÉÁAzÉæ ±ÁjÁ¥sÁgÁ PÁvÁÁAiÁ¼ÁtÁ, ¥ÁPÁ=ÁPÁgÁÁ zÉÁ¼ÁÁUÁ, °EAU¼ÁsgÁÁ. 2013
16. uÁÁ. ©.Juí. PÉÁ±AvÁgÁvÁ. PÉÉeÁuÁÁ PÁ£ÁBqÁ £ÁIPÁUÁ¼ÁÁ, ¥ÁPÁ=ÁPÁgÁÁ ÇAQvÁ ¥ÁÁUÁUÁ, °EAU¼ÁsgÁÁ. 2005
17. ±AvÁÁgÁÁ¼Á¼Á vÁuÁÁ., PÁ£ÁBqÁ uÁ»vÁá ZÁjvÉ, ¥ÁPÁ=ÁPÁgÁÁ vÁ¼ÁÁQÉÁ vÉAPÁtÁ¼Á¼Á uÁÁgÁPÁ UÁæAvÁÁtÁeÉ, vÉÁEúÁsgÁÁ -2014
18. zAvÁÁZÁÁ¼Á¼Á f.Juí. PÁ£ÁBqÁ uÁ»vÁá uÁ«ÁÁPÉç ¥ÁPÁ=ÁPÁgÁÁ uÁçFÁB §ÁPi °Eui, °EAU¼ÁsgÁÁ. 2013

|                          |                   |          |          |          |          |
|--------------------------|-------------------|----------|----------|----------|----------|
| <b>B19PS2012</b>         | <b>Hindi - II</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration : 14 WKS</b> |                   | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**Prerequisites:**

यह पाठ्यक्रम नैतिक विद्या, अपनी भाषा की श्रमता का निकाषि करने हेतु तथा निसभर िसहसयक ण्युवाओं द्वारा िमाज,

**Course Objectives:**

िकृषत ंिज्ीन के ण्युओं को िमदन हेतु असभक ण्युत हे

- िंदनानुिधर उतित भाषा का ण्युग करने की दता को छुणने में उवात्र करना |
- िसहसय के ण्युयम िंकिमाज ंिंनानिय ण्युओं को िमदनकर, उन ण्युओं की रस हेतु ण्युत करना |
- छुणने में ण्युत पठन ंिंज्ीन की अकृषत ण्युि स्यापत करना |
- अश्रुतओं में िसहसय के ण्युयम िं ण्युि ंिंज्ीन िंज्ीन का निकाषि करना |

**Course Outcomes:**

अश्रुत की िमाषि पर अश्रुत —

- िसमाजक ण्यु ंिंनानिक ज्ीनबददी को ण्युीकार कर िकता हे
- िसहसय की ण्युिकता को ज्ीन में िमदन की दता रितता हे
- िमाज में अंशहृत ण्युतयों ंिंज्ीन िंज्ीन का ण्युखान करने में िश्रम वन िकता हे

## Mapping of Course Outcomes with programme Outcomes

| Course Code | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS2011   | CO1     |     |     |     |     | 2   | 3   | 2   |     |      |      |
|             | CO2     |     |     |     |     | 2   | 2   | 3   |     |      |      |
|             | CO3     |     |     |     |     | 3   | 3   | 3   |     |      |      |
|             | CO4     |     |     |     |     | 3   | 2   | 3   |     |      |      |

### Course Contents:

**इकाई – 1:** परिचय, आभिनय कला

अध्ययन असाईनमेंट 12 hrs.

1. कबीर के दोहे
2. कला – जनलयापनीयता का मूल्य - विष्णु, शुकुमार की कला
3. कला – विष्णु की मूर्त्ति पर - विमर्शिका भारती

**इकाई – 2:** मध्यकालीन कला, आभिनय कला

अध्ययन असाईनमेंट 12 hrs.

4. कला के दोहे
5. कला – हमारी मजदूरी - केदारनाथ शर्मा
6. कला – कला हमारा काम है - शिशुमंगल सिन्हा

**इकाई – 3:** मध्यकालीन कला, आभिनय कला

अध्ययन असाईनमेंट 12 hrs.

7. मीराबाई के पद
8. कला – मेरुपिने बहुत नही है - मंगलेश कुमार मथुरा
9. कला – अभी न होगा मेरा अंत - मनमोहन

**इकाई – 4:** अनुवाद, मनमोहन

अध्ययन असाईनमेंट 12 hrs.

अनुवाद : मही - अग्नी

वि

दु :

मनमोहन

वि





|     |  |  |  |  |   |   |   |   |  |  |
|-----|--|--|--|--|---|---|---|---|--|--|
| 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. Raman*. PrabhatPrakashan, 2016.
5. Rozewicz, Tadeusz. *New Poems*. Archipelago, 2007.

|                        |                                |          |          |          |          |
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| <b>B19PS2020</b>       | <b>Functional English - II</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                                | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

#### 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/<br>COs | PO1 | P2 | PO3 | PO4 | PO5 | PO6 | P7 | PO8 | PSO1 | PSO2 |
|-------------|-------------|-----|----|-----|-----|-----|-----|----|-----|------|------|
| B19PS2020   | 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

**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. Dixon, Robert J. *Everyday Dialogues in English*. Prentice Hall India Pvt Ltd., 1988.
5. Turton, Nigel D. *ABC of Common Errors*. Mac Millan Publishers, 1995.
6. Samson, T. (ed.) *Innovate with English*. Cambridge University Press, 2010.
7. Kumar, E Suresh, J. Savitri and P Sreehari (ed). *Effective English*. Pearson Education, 2009.
8. Goodale, Malcolm. *Professional Presentation*. Cambridge University Press, 2013.

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|------------------------|--------------------------------|----------|----------|----------|----------|
| <b>B19PS2030</b>       | <b>Heat and Thermodynamics</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                                | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**Prerequisites:**

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 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS2030   | 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 5<sup>th</sup> 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 Edition, John Wiley & Sons, Inc. Kittal & Dekkar

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| <b>B19PS2040</b> |  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|------------------|--|----------|----------|----------|----------|

|                        |                       |          |          |          |          |
|------------------------|-----------------------|----------|----------|----------|----------|
| <b>Duration:14 Wks</b> | <b>Mathematics-II</b> | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |
|------------------------|-----------------------|----------|----------|----------|----------|

**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.

**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     |
|------------------|------------|----------|----------|----------|-----|-----|-----|-----|-----|----------|----------|
| <b>B19PS2040</b> | <b>CO1</b> | <b>3</b> | <b>2</b> | <b>2</b> |     |     |     |     |     | <b>3</b> | <b>2</b> |
|                  | <b>CO2</b> | <b>2</b> | <b>2</b> | <b>2</b> |     |     |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO3</b> | <b>3</b> | <b>2</b> | <b>2</b> |     |     |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO4</b> | <b>3</b> | <b>2</b> | <b>2</b> |     |     |     |     |     | <b>3</b> | <b>2</b> |

**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.

|                        |                                |          |          |          |          |
|------------------------|--------------------------------|----------|----------|----------|----------|
| <b>B19PS2050</b>       | <b>Data Structures using C</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                                | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**Prerequisites:**

Computer Programming knowledge

**Course Objectives:**

The objectives of this course are to:

1. Assess how the choice of data structures and algorithm design methods.
2. Choose the appropriate data structure and algorithm design method for a specified



- application.
3. Write programs using function-oriented design principles.
  4. Solve problems using data structures such as linear lists, stacks, queues, trees.

|                         |
|-------------------------|
| <b>Course Outcomes:</b> |
|-------------------------|

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

1. Develop suitable algorithm for any application.
2. Analyze algorithm based on time and space complexity.
3. Write efficient program to implement any data structure.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/<br>COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS2050   | CO1         | 3   | 3   | 3   | 3   | 2   |     | 2   | 3   | 3    | 3    |
|             | CO2         | 3   | 3   | 3   | 2   |     |     |     | 3   | 3    | 3    |
|             | CO3         | 3   | 3   | 3   | 3   | 2   |     | 2   | 3   | 3    | 2    |
|             | CO4         | 3   | 3   | 3   | 2   |     |     | 2   | 2   | 3    | 2    |

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|-------------------------|
| <b>Course Contents:</b> |
|-------------------------|

**UNIT -I:**

**12 Hrs**

Introduction and Overview: Definition of Data Structures, Elementary data organization, data structures operations, String Processing: Definition, Pointers, Storing Strings, String operations.

Arrays: Definition, Linear arrays, Representation of Linear Arrays in Memory, Traversing Linear arrays, Inserting and deleting elements into arrays.

**UNIT - II:**

**12 Hrs**

Sorting: Bubble sort, Insertion sort, Selection sort, searching: Linear Search, Binary search, Multidimensional arrays, Matrices and Sparse matrices. Stacks – Definition, Array representation of stacks, Linked representation of stacks, Arithmetic Expressions: Polish Notation, Application of Stacks, Recursion, Towers of Hanoi, Implementation of recursive procedures by stack.

**UNIT - III:****12 Hrs**

Queues – Definition, Array representation of queue, Linked list representation of queues Types of queue: Simple queue, Circular queue, Double ended queue, Priority queue, Operations on Queues. Linked list: Definition, Representation of Singly linked list in memory, Traversing a Singly linked list, Searching a Singly linked list, Insertion into a singly linked list, Deletion from a singly linked list.

**UNIT - IV:****12 Hrs**

Doubly linked list, Header linked list, Circular linked list. Tree – Definitions, Binary trees, representing binary trees in memory, Traversing binary trees. Graphs: Graph theory terminology, Sequential representation of Graphs: Adjacency matrix, traversing a Graph.

**Text Book:**

1. Data Structures Using C – A M Padma Reddy, Sri Nandi Publications.

**Reference Books:**

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 2013.
2. Robert Kruse, C.L.Tondo, Bruce Leung, ShashiMogalla, “Data Structures and Program Design using C”, Pearson Education, 2009.
3. Seymour Lipschutz, “Data Structures with C”, Schaum’soutLines, Tata McGraw-Hill, 2011.

|                         |                               |          |          |          |          |
|-------------------------|-------------------------------|----------|----------|----------|----------|
| <b>B19PS2060</b>        | <b>Environmental Sciences</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration: 14 Wks</b> |                               | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**Prerequisites:**

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

**Course Objectives:**

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 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS2060   | 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 Anilkumar Dey and Arnab kumar Dey.

| Course Code | Sports / Yoga / Music /<br>Dance / Theatre | L | T | P | C |
|-------------|--|---|---|---|---|
| B19SM2070   |  | 2 | 0 | 0 | 2 |

**Note:** Music, Dance, and Theater courses are offered by the School of Performing Arts, whereas the Sports and Yoga courses are offered by the Department of Physical Education. The students shall choose any **ONE** of these courses.

### A. YOGA FOR HEALTH

#### Course Objectives:

Following are the Course Objectives.

- To prepare the students for the integration of their physical, mental and spiritual faculties;
- To enable the students to maintain good health;
- To practice mental hygiene and to attain higher level of consciousness;
- To possess emotional stability, self control and concentration; and
- To inculcate among students self discipline, moral and ethical values.

#### Course Outcomes:

On completion of the course learners will be able to:

- Practice yoga for strength, flexibility, and relaxation.
- Learn techniques for increasing concentration and decreasing anxiety
- Become self disciplined and self-controlled
- Improve physical fitness and perform better in studies
- Gain self confidence to face the challenges in the society with commitment to serve the society

#### Course Content:

##### UNIT-I:

**Yoga:** Introduction ; **Surya Namaskara:-** 12 counts

##### UNIT-II:

**Asanas: Sitting-** Vajrasana, Dandasana, Padmasana, Matsyasana, Paschimottasana, Shirasasana.

**Asanas: Standing-** Tadasana, Trikonasana, Parshwa konasana, Veerabhadrasana.

##### UNIT-III:

**Asanas: Prone Position-** Bhujangasana, Dhanurasana.

**Asanas: Supine Position-** Sarvangasana, Halasana.

**Mudras-** Dhyana mudra, , Namaste mudra, Nasika mudra

#### **UNIT-IV:**

**Pranayams:-** Anuloma – Viloma, Basthrika, Bhramari.

**Dhyana & its types:** Competition format, Rules and their interpretations

### **B. VOLLEYBALL**

#### **Course Objectives:**

To learn the rules, fundamental skills, and strategies of volleyball

1. To develop skills in passing, setting, serving, spiking, and blocking.
2. To learn basic offensive and defensive patterns of play.
3. To develop a positive attitude towards volleyball as a lifetime sport and to improve physical fitness through participation in volleyball.

#### **Course Outcomes:**

On completion of the course learners will be able to:

1. Learn basic skills and knowledge associated with volleyball.
2. Apply these skills while playing volleyball and exhibit improved performance
3. Improve physical fitness and practice positive personal and lifestyle.
4. Gain an understanding of the value of sports in attaining wellness, maintaining good health and developing spirit of teamwork.

#### **Course Content:**

##### **UNIT-I**

- Introduction about Volleyball
- Players Stance, Receiving and passing
- The Volley (Overhead pass), The Dig (Underhand pass), Service Reception

##### **UNIT-II**

- Service- Under Arm Service, Tennis Service, Side Arm Spin Service, Round Arm Service, High spin service, Asian serve / American serve (floating)
- Setting the ball- Set for attack, Back set, Jump set

##### **UNIT-III**

- Smash/Spike- Straight smash, Body turn smash, Wrist outward smash, Wrist inward smash
- Block- Single block, Double block, Three-man block
- Rolls- Overhead pass & back rolling, One hand underhand pass with side rolling, Forward dive

## **UNIT-IV**

- Attack Combination, Defense Systems, Libero play
- Court marking, Rules and their interpretations and Duties of officials

### **C. BASKETBALL**

#### **Course Objectives:**

1. To learn the rules, fundamental skills, and strategies of Basketball
2. To develop technical skills in passing, in ball handling, individual offense, individual defense, rebounding, screen, team offense, team defense and fast break.
3. To learn basic offensive and defensive strategies of play.
4. To develop a positive attitude towards Basketball as a lifetime sport and to improve physical fitness through participation in Basketball.
5. To develop positive understanding and appreciation of the basketball game.

#### **Course Outcomes:**

On completion of the course learners will be able to:

1. Learn basic skills and knowledge associated with basketball.
2. Apply these skills while playing basketball and exhibit improved performance
3. Improve physical fitness and practice positive personal and lifestyle.
4. Gain an understanding of the value of sports in attaining wellness, maintaining good health and developing spirit of teamwork.

#### **Course Content:**

### **UNIT-I**

- Basketball: Introduction
- Grip; Player stance- Triple threat stance and Ball handling exercises
- Passing (Two hand/one hand)- Chest pass, Bounce Pass, Over head pass, Underhand pass, Hook Pass, Behind the back pass, Baseball pass, Side arm pass and passing in running.
- Receiving-Two Hand receiving, One hand receiving, Receiving in stationary position, Receiving while jumping, Receiving while running.

### **UNIT-II**

- Dribbling- How to start dribble, How to stop dribble, High / Low dribble with variations
- Shooting- Layup shot and its variations, One hand set shot, One hand jump shot, Free throw, Hook shot, Tip-in shot.

- Stopping- Stride/Scoot, Pivoting and Faking /Feinting footwork.

### **UNIT-III**

- Rebounding- Defensive rebound, Offensive rebound, Box out, Rebound Organization.
- Individual Defensive- Guarding the man with the ball and without the ball.
- Offensive drills, Fast break drills, Team Defense/Offense, Team Tactics

### **UNIT-IV**

- Court marking, Rules and their interpretations

### **D. FOOTBALL**

#### **Course Objectives:**

1. To learn the rules, fundamental skills, and strategies of football.
2. To develop skills in passing, receiving, controlling the ball, dribbling, shielding, shooting, tackling, beating a defender and heading in football.
3. To learn basic offensive and defensive patterns of play
4. To use different parts of the body in utilizing the above skills while playing football
5. To develop a positive attitude towards football as a lifetime sport and to improve physical fitness through participation in football.

#### **Course Outcomes:**

On completion of the course learners will be able to:

1. Learn basic skills and knowledge associated with football.
2. Apply these skills while playing football and exhibit improved performance
3. Use the knowledge and understanding to perform, refine and adapt the above skills and related skills with precision, accuracy, fluency and clarity in any situation.
4. Improve physical fitness and practice positive personal and lifestyle.
5. Gain an understanding of the value of sports in attaining wellness, maintaining good health and developing spirit of teamwork.



## **Course Content:**

### **UNIT-I**

#### **Football: Introduction**

- Kicks- Inside kick, Instep kick, Outer instep kick, Lofted kick, Chipping, Volley, Half Volley
- Trapping- Trapping rolling the ball, Trapping bouncing ball with sole

### **UNIT-II**

- Dribbling- With instep and outer instep of the foot.
- Heading- From standing, running and jumping.
- Feinting- With the lower limb and upper part of the body.

### **UNIT-III**

- Tackling- Simple tackling, Slide tackling.
- Throw-in- Standing and Sliding
- Goal Keeping- Collection of balls, Ball clearance, throwing and deflecting.

### **UNIT-IV**

- Ground marking, Rules and their interpretations

## **E. ATHLETICS (TRACK AND FIELD )**

### **Course Objectives:**

1. To teach students the skilled techniques in sprints, relay running, hurdles, long jump, high jump, and shot put and practice them.
2. To develop competence among students in demonstrating all the techniques covered in the course.
3. To make students understand some of the scientific and empirical principles and their rationale underlying the development of skilled performance.
4. To inculcate among students the habit of team work and cooperative learning and develop competence in detecting / correcting technique errors.
5. To develop a positive attitude towards sports in general and athletics in particular and to improve physical fitness through participation in various athletic games / sports activities.

### **Course Outcomes:**

On completion of the course learners will be able to:

1. Display competencies in executing basic techniques and skills associated with select track and field events.

2. Develop basic skills and techniques to improve one's running posture and take-off position for different jumps.
3. Learn regular practice of select track and field events and improve physical fitness
4. Appreciate track and field events by applying sports science knowledge to explain the execution of the events.

**Course Content:**

**UNIT-I**

- Athletics: Introduction
- Track Events - Steeple Chase, Race Walking, Middle and Long distance races
- Race walking - Technique, Faults and Officiating.
- Middle and Long distance races – Technique and Training

**UNIT-II**

- Jumping Events - High Jump and Triple Jump: Basic Skills and techniques
- High Jump - Straddle Roll & Flop Technique, Approach, Take-off, Technique in the air, Clearance over the bar & Landing
- Triple Jump – Hop, Step and Jump Technique, Approach, Take-off & Landing

**UNIT-III**

- Throwing Events - Discus Throw and Hammer Throw: Basic Skills and techniques
- Discus Throw - Standing and Rotatory techniques, Grip, Stance, Rotation Technique, Power stance, Release and Reverse (Follow through)
- Hammer Throw - Grip, Swings, Rotation foot work, Release and Follow through

**UNIT-IV**

- Rules, Officiating and Marking - Ground / Sector Marking, Interpretation of Rules.

**Reference Books**

1. Arthur E. Ellison (ed) (1994). Athletic Training and Sports Medicine.
2. Ballisteros, J.M. (1998). Hurdles Basic Coaching Manual, IAAF.
3. Bosen K.O. (1993). Teaching Athletics Skills and Technique.
4. Bosen K.O. (1990). Study Material on Hurdles for the Regular Course Students.
5. Doherty K. (1995). Track and Field Omni book.

6. Martin, David E. Peter N. Coe (1991). Training Distance Runner.
7. Howard S. (1981). Science of Track and Field Athletics.
8. Briggs Graeme (1987). "Track and field coaching Manual", Australian Track and Field Coaches Association. Rothmans Foundation National Sports Division.
9. Carr, Gerry (1999). "Fundamentals of Track and Field. Track Athletics Title G.V. 1060 5.e. 368.
10. I.A.A.F. Level-II (2001). Text Book on Jumping Event.
11. Jarver, Jesse (1987). "The Jumps", Track and Field Coaching Manual Australia.

## **F. DRAMATICS**

**Pre-requisites:** Students with background in Theatre Arts/ Keen interest in Dramatics.

### **Course Objectives:**

- To imbibe the acting skills.
- To understand the broader applications of theatre studies in allied arts forms.
- To be able to use body language for better communication.
- Students shall also be able to understand voice modulation and Navarasas.

### **Course Outcomes:**

On successful completion of this course, students should be able to:

- Freely express improvisation in non-verbal communication.
- Shall hone good acting skills and be able to emote better.
- Be able to put up a theatre act and play a key role.
- Be able to differentiate good acting and understand the importance of good lyrics, stage crafting, music, dance, costume and lighting.

### **Course Content:**

#### **UNIT – 1**

##### **Working on Body:**

Body and its analysis. Understanding physical abilities ( Anga, Pratyanga and Upanga). Challenges of the body. Using body as metaphor and language. The class's bodies as a collective, an ensemble, a collaborative team.

#### **UNIT – 2**

##### **Sound and Movement:**

Awareness of creating sound patterns, voice modulations, rhythm in speech and dialogues. Understanding the rhythm and patterns of movements like walking, framing, shaping, primitive and animal movements.

### **UNIT – 3**

#### **Characterization and Improvisation:**

Observation of people around. Getting into the role and living it. Developing a character from establishment (pace and rhythm). Improvisation techniques of body and mind.

### **UNIT – 4**

#### **Group work and Production:**

Develop a theme, concept or a play and include all the theatre skills, stage craft, costuming and put up an act. Choosing theme and characters.

#### **Reference Books:**

1. All about Theatre – Off stage – Chris Hogget.
2. Rangadalli Anataranga – K V Subbanna
3. The Indian Theatre – Hemendranath Das Gupta.
4. A Practical handbook for an Actor – Milisa Bruder, ee Milchel Cohn, Madeleine Oliek et al, Zigler Publisher.

### **G. INDIAN CLASSICAL DANCE FORMS (Bharatanatyam, Kuchipudi, Mohiniyattam)**

**Prerequisites: Background of classical dance training or any other dance forms.**

**Note: Non-classical dancers can also join.**

#### **Course Objectives:**

- To develop an understanding about the Indian classical dance forms and its universal application.
- To be able to understand the fine nuances of Classical dance.
- To understand the importance of health through Indian classical dance, strengthen the body capacity.
- To understand mythology and its characters in Indian classical dance form through lessons of Abhinaya.

#### **Course Outcomes:**

- To be able to identify and appreciate the classical dance forms.
- To be able to execute basics of Adavus with finesse.
- To be able to express through abhinaya.
- To be able to perform to perform the fundamentals in the chosen dance form.

**Course Content:****UNIT – 1**

An introduction to Indian classical dance forms

Bharatanatyam, Kuchipudi, Mohiniyattam

**UNIT - 2**

Learning of Fundamentals

Exercises and Adavus- I (Bharathanatyam, Kuchipudi, Mohiniyattam)

**UNIT - 3**

Adavus –II (Bharathanatyam, Kuchipudi, Mohiniyattam)

**UNIT - 4**

Learn a basic composition in the chosen dance form.

**Reference Books**

1. Indian classical dance forms –U S Krishna Rao,U K Chandrabhaga Devi
2. Classical Dances –Sonal Mansingh, Avinash Parischa
3. Kuchipudi – Sunil Kothari
4. Bharatanatyam An in depth study- Saroja vydyanathan
5. Mohiniyattam – Bharathi Shivaji

**H. PERCUSSION INSTRUMENT (TABLA AND MRIDANGAM)**

**Pre-requisites:** Students with background in Percussion instruments and knowledge of Rhythm/ Keen interest in studying Mridagam / Tabala.

**Course Objectives:**

- To understand the Rhythmology.
- To understand the importance of Laya, Taala.
- To be able to understand the fine finger techniques of playing the instrument.

**Course Outcomes:**

On successful completion of this course, students should be able to:

- To be able to set instrument to Sruthi.
- To be able to play the fundamentals on instrument.
- To be able to learn and perform a particular taala.

**Course Content:**

**UNIT - 1**

1. Introduction to Musical Instruments; 2. Percussion Instruments; 3. Mridangam and its History

**UNIT - 2**

1. Introduction to Tala System; 2. Definitions of five jaathis and their recitation; 3. Adi Talam and its various forms; 4. Definitions and recitation of different gathis

**UNIT - 3**

1. Tisra Jaathi; 2. Khanda Jaathi; 3. Misra Jaathi; 4. Sankeerna Jaathi

**UNIT - 4**

1. Learning of Jathi Formation; 2. Basic jathis; 3. Jathis for Dance forms ; 4. Some Basic Definitions of Korvai, Teermanam etc.

**Reference Books:**

1. Mridangam- An Indian Classical Percussion Drum – Shreejayanthi Gopal
2. Theory and practice of Tabala – Sadanand Naimpally.
3. Theory and practice of Mridangam – Dharmala Rama Murthy
4. The Art of the Indian Tabala – Srdjan Beronja

|                         |                        |          |          |          |          |
|-------------------------|------------------------|----------|----------|----------|----------|
| <b>B19PS2080</b>        | <b>Physics Lab -II</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14 Wks</b> |                        | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**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. Familiarize with the concepts of thermal conductivity through experiments
3. Familiarize 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. Analyze 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/<br>COs | PO1      | PO2      | PO3      | PO4      | PO5      | PO6 | PO7 | PO8 | PSO1     | PSO2     |
|------------------|-------------|----------|----------|----------|----------|----------|-----|-----|-----|----------|----------|
| <b>B19PS2080</b> | <b>CO1</b>  | <b>3</b> | <b>2</b> | <b>2</b> |          | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO2</b>  | <b>3</b> | <b>2</b> | <b>2</b> | <b>1</b> | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO3</b>  | <b>2</b> | <b>2</b> | <b>2</b> | <b>2</b> | <b>2</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO4</b>  | <b>3</b> | <b>2</b> | <b>2</b> |          | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |

**Course Contents:**

5. Any Eight of the Following Experiments
6. Verification of Gaussian distribution law and calculation of standard deviation –Monte Carlo experiment.
7. Specific heat of a liquid by cooling – graphical method.
8. Determination of thermal conductivity of a bad conductor by Lee-Charlton method.
9. Verification of Stefan – Boltzmann law by using Ohm’s law.
10. Determination of boiling point of a liquid using platinum resistance thermometer.
11. Determination of moment of inertia of irregular body using Torsional pendulum.
12. Determination of rigidity modulus by the static torsion method.
13. Determination of Young’s modulus by uniform bending method.
14. Spiral spring: Determination of the acceleration due to gravity (graphical method).
15. Determination of wavelength of a given LASER by diffraction method
- 16.

**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).

**Prerequisites:**

Definition and properties of groups, concept of polar and Cartesian form, formulas and

|                         |                            |          |          |          |          |
|-------------------------|----------------------------|----------|----------|----------|----------|
| <b>B19PS2090</b>        | <b>Mathematics Lab -II</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14 Wks</b> |                            | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

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     |
|------------------|------------|----------|----------|----------|----------|----------|-----|-----|-----|----------|----------|
| <b>B19PS2090</b> | <b>CO1</b> | <b>3</b> | <b>2</b> | <b>2</b> |          | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO2</b> | <b>3</b> | <b>2</b> | <b>2</b> | <b>1</b> | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO3</b> | <b>2</b> | <b>2</b> | <b>2</b> | <b>1</b> | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO4</b> | <b>3</b> | <b>2</b> | <b>2</b> |          | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |

**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

|                           |                            |          |          |          |          |
|---------------------------|----------------------------|----------|----------|----------|----------|
| <b>B19PS2010</b>          | <b>Data Structures Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14 Weeks</b> |                            | 0        | 0        | 2        | 2        |

**Prerequisites:**

The basic data structures like Arrays, Linked Lists, some of the basic algorithms like Sorting, Searching and mathematics knowledge.

**Course Objectives:**

The objectives of this course are to:

1. To develop skills to design and analyze simple linear and nonlinear data structures
2. To strengthen the ability to identify and apply the suitable data structure for the given real world problem
3. To gain knowledge in practical applications of data structures

**Course Outcomes:**

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

1. To learn elementary data structures such as stacks, queues, linked lists, trees and graphs
2. To design algorithms to solve the problems
3. To design and analyze the time and space efficiency of the data structure
4. To discuss different data structures to represent real world problems

**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/COs    | PO1      | P2       | PO3      | PO4      | PO5 | PO6 | P7       | PO8      | PSO1     | PSO2     |
|-------------|------------|----------|----------|----------|----------|-----|-----|----------|----------|----------|----------|
| B19PS2050   | <b>CO1</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |     |     | <b>2</b> | <b>3</b> | <b>3</b> | <b>3</b> |
|             | <b>CO2</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |     |     |          | <b>3</b> | <b>3</b> | <b>3</b> |



uÁvÁiÁÉÁVÉ vÁÁsr<sup>1</sup>, \*\*É%ÉuÁÁvÁ ðnÖÉÁæ ¥ÁoÁUÁVÁ DÁiÉÁiÁiÁVzÉ.

3. CvÁgÁÁèuÁÉÉÁ<sup>2</sup>Á@vÉ, ±ÁÁzÁ ÒÁµÉ, GvÁvÁÁ «vÁÁ±Áð UÁÁt, ðgÁUÁðVÁ uÁÁ'sÁµÁuÉ, \*\*ÁµÁt PÁeÉ °ÁUÁs §gÁ°Á PÉ±Á@ÁUÁVÁÉÁÁB \*\*É%ÉuÁÁvÁzÁÁ UÁÁjÁiÁiÁVzÉ

4. uÁzÁÁðvÁPÁ ¥ÁjÁPÉUÁ½UÉ CÉÁÁPÁs@vÁUÁÁvÁÁvÁ°Á «µÁÁiÁÁUÁVÁÉÁÁB UÁvÁÁÉÁzÁÁááLÁÖPÉsÁqÁÁ uÁsPÁ ¥ÁoÁUÁVÁÉÁÁB DÁiÉÁi vÁiÁrPÉsVÁieÁVzÉ.

**Course Outcomes:**

°EsÁUÁÁðqÁ , Á»vÁÁ HÁrPÁgÁUÁVÁzÁ ÁÉÇÁzÁÁiÁÁ, ÁÁÁ PÁÁÁ, ÁÚPÁxÉUÁVÁÁ °ÁUÁÁ ÁÁIPÁ ,Á»vÁÁ PÁ°PÉÁiÁÁ °ÁÁs@PÁ PÁ@zÁ ÁvÁÁvÁgÁUÁVÁÁÁÁ CzágÁ M%ÁÁsÁÁ UÁVÁÁÁB \*\*É%ÉÁÁvÁUzÉ.

1. uÁvÁiÁÁfPÁ, gÁDQÁÁiÁÁ, zÁ«ÁðPÁ, uÁÁuÁÁvPÁ °ÁUÁs áAUÁÁÁÁsÁçü«ZÁgÁUÁVÁÉqÉ UÁvÁÁÉÁ°Áj uÁÁvÁzÁgÉsÁçUÉ «zÁÁyðUÁVÁÁèZÁZÁð vÁÁÉsÁÁÁvÁvÁç \*\*É%ÉÁiÁÁÁvÁzÉ.

2. fÁvÁÉÁzÁÁè §gÁÁvÁ C@ÁÁÁiÁÁ \*\*ÉÁzÁUÁVÁÁ, uÁvÁÁUÉUÁVÁÉÁÁB DzÁÁPÁ uÁAzÁÁðzÁÁè vÁiÁÉÁ«ÁÁiÁÁvÉÁiÉsÁçUÉ ðvÁð»uÁÁvÁÁvÉ ¥ÉÁgÉÁ! uÁÁvÁzÉ.

3. GvÁvÁÁ uÁÁvÁ°ÁÉÁ PÁeÉÁiÁÁÉÁÁB \*\*É%ÉuÁÁvÁ GzÁÁ±ÁvÁÉÁÁB FqÉÁj uÁÁvÁz5.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/COs | PO1 | P2 | PO3 | PO4 | PO5 | PO6 | P7 | PO8 | PSO1 | PSO2 |
|-------------|---------|-----|----|-----|-----|-----|-----|----|-----|------|------|
| B19PS3011   | CO1     |     |    |     |     | 2   | 3   |    |     |      |      |
|             | CO2     |     |    |     |     | 2   | 3   |    |     |      |      |
|             | CO3     |     |    |     |     |     | 3   |    |     |      |      |
|             | CO4     |     |    |     |     |     |     | 3  | 2   |      |      |

**Course Content:**

**UNIT – I** **[12 Hrs]**

vÁÁÁçÁiÁÁ gÁvÁÁUÉqÁ - ©. JA. 2zÁ

\*\*É%ÁUÁÁ - zÁ.gÁ. \*\*ÉÁzÉæ

PÁÁi - PÁÁvÉÁ¥ÁÁ

gÁvÁB \*\*ÉÁvÁ<sup>1</sup>ð - f. !. gÁDgÁvÁÁA

**UNIT – II** **[12 Hrs]**

CvÁzÁsvÁ - uÁÁ.gÁÁ.JPÁÁiÁr

vÁÁÉÉ-ÁAzÁ vÁÁÉÉUÉ - PÉ.Juī.ÉÁ

ÉÁÁB °ÁtvÉ - f. Juī. Juī.

agÁAvÁÉÁ zÁ°Á - ZÁÉÁ«ÁgÁ PÁt«

**UNIT – III** **[12 Hrs]**

vÁÁÁzÁÁt vÁÁÉÉsÁgÁvÉÁ uÁeÁé¥Á - vÁÁÁzÁÁt

zÁ½ fÁqÉzÁvÁ CuÁÚ- CvÁÁgÉÁ±Á fÁÁUÁqÉsÁtÁ

PÉsÉÉÁiÁÁ VgÁQ - ðgÁÁDfÁ

CvÁÉÁw - vÉÁd<sup>1</sup>é

**UNIT – IV** **[12 Hrs]**



है।

4. साहित्य के माध्यम से प्रवाची 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 |
|-------------|---------|-----|----|-----|-----|-----|-----|----|-----|------|------|
| B19PS3012   | CO1     |     |    |     |     | 2   | 3   | 2  |     |      |      |
|             | CO2     |     |    |     |     | 2   | 2   | 3  |     |      |      |
|             | CO3     |     |    |     |     | 3   | 3   | 3  |     |      |      |
|             | CO4     |     |    |     |     | 3   | 2   | 3  |     |      |      |

#### Course Content:

#### अध्ययन विषय विषय / पाठ्यक्रम

**इकाई – 1:** नविक : एक और / लेखिका – डॉ. शंकर शेष

लेखक पररिय

प्रथम दृश्य

द्वितीय दृश्य

**इकाई – 2:** नविक : एक और / लेखिका

hrs. तृतीय दृश्य

चित्र दृश्य

**इकाई – 3:** नविक : एक और / लेखिका

अध्यापन अिसिया : 12 hrs.

अध्यापन अिसिया : 12

अध्यापन अिसिया : 12 hrs.



**Course Outcomes:**

On completion of the course, learners 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/<br>COs | PO1 | P2 | PO3 | PO4 | PO5      | PO6      | P7       | PO8      | PSO1 | PSO2 | PSO3 |
|------------------|-------------|-----|----|-----|-----|----------|----------|----------|----------|------|------|------|
| <b>B19PS3013</b> | <b>CO1</b>  |     |    |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |      |      |      |
|                  | <b>CO2</b>  |     |    |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |      |      |      |
|                  | <b>CO3</b>  |     |    |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |      |      |      |
|                  | <b>CO4</b>  |     |    |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |      |      |      |

**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 Verbs **Writing 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 Writing Activities: Offers, Suggestions & Requests, Literature: Avijit Pathak – Onscreen Magic.

|                         |                                |          |          |          |          |
|-------------------------|--------------------------------|----------|----------|----------|----------|
| <b>B19PS3020</b>        | <b>Communicative English-1</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration: 14 WKS</b> |                                | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

#### 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/<br>COs | PO1 | P2 | PO3 | PO4 | PO5      | PO6      | P7       | PO8      | PSO1 | PSO2 | PSO3 |
|------------------|-------------|-----|----|-----|-----|----------|----------|----------|----------|------|------|------|
| <b>B19PS3020</b> | <b>CO1</b>  |     |    |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |      |      |      |
|                  | <b>CO2</b>  |     |    |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |      |      |      |
|                  | <b>CO3</b>  |     |    |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |      |      |      |
|                  | <b>CO4</b>  |     |    |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |      |      |      |



|                         |
|-------------------------|
| <b>Course Contents:</b> |
|-------------------------|

**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 Guides, 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, 2019.

|                          |                         |          |          |          |          |
|--------------------------|-------------------------|----------|----------|----------|----------|
| <b>B19PS3030</b>         | <b>Waves and Optics</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration: 14Weeks</b> |                         | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**Prerequisites:**

This is an introductory physics course which covers topics in simple harmonic motion, waves, basic theory of light, optics, optical instruments and optical phenomena 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/<br>COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS3030   | 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  $\lambda$  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, 2<sup>nd</sup> edition, Oxford University Press, 2006.
4. Brijlal ,N. Subramanyam P.S. Hemne: Heat Thermodynamics and Statistical Physics, 1<sup>st</sup> edition. S Chand Publishing, 2007.
5. S C Gupta: Thermodynamics, 1<sup>st</sup> edition, Pearson, 2005.

6. Satya Prakash: Optics and Atomic Physics, 11<sup>th</sup>, 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, 2<sup>nd</sup> edition, Sulthan Chand and Sons, 1990.

|                        |                  |   |   |   |   |
|------------------------|------------------|---|---|---|---|
| B19PS3030              | Mathematics –III | L | T | P | C |
| <b>Duration:14 Wks</b> |                  | 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:** After the completion of the course, the student will be able to:

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 |
|-------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS3030   | 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, Kernel 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).

|                 |       |   |   |   |   |
|-----------------|-------|---|---|---|---|
| B19PS3050       | RDBMS | L | T | P | C |
| Duration:14 Wks |       | 2 | 1 | 0 | 3 |

**Prerequisites:**

DBMS fundamentals, the proper understanding of data structures and algorithms will help you to understand the DBMS quickly.

**Course Objectives:**

The objectives of this course are to:

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

**Course Outcomes:**

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

1. To describe data models and schemas in DBMS
2. To use SQL- the standard language of relational databases.
3. To understand the functional dependencies and design of the database.
4. To understand the concept of Transaction and Query processing

**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS3050   | CO1     | 3   | 3   | 3   | 2   |     |     |     | 3   | 2    | 3    |
|             | CO2     | 3   | 3   | 2   | 2   |     |     | 2   | 2   | 3    | 2    |
|             | CO3     | 3   | 3   | 2   | 2   |     |     | 2   |     | 3    | 3    |
|             | CO4     | 3   | 3   | 3   | 2   |     |     | 2   | 3   | 3    | 2    |

**Course Contents:**

UNIT – I:

12

Hrs

Introduction: Database and Database Users, Characteristics of the Database Approach, Different people behind DBMS, Implications of Database Approach, Advantages of using DBMS, when not

to use a DBMS. Database System Concepts and architecture: Data Models, Schemas, and Instances. DBMS Architecture and Data Independence., Database languages and interfaces. The database system Environment, Classification of DBMS.

UNIT - II: 12 Hrs

Data Modelling Using the Entity-Relationship Model: High level conceptual Data Models for Database Design with and example., Entity types, Entity sets, attributes, and Keys, ER Model Concepts, Notation for ER Diagrams, Proper naming of Schema Constructs Functional Dependencies and Normalization for Relational Database: Informal Design Guidelines for Relational schemas, Functional Dependencies, Normal Forms Based on Primary Keys., General Definitions of Second and Third Normal Forms Based on Primary Keys, Boyce-Codd Normal Form.

UNIT - III: 12 Hrs

RDBMS: Relational database concepts – attribute, tuple, types of attributes – single, multi-valued, stored, derived etc., keys – primary, index, candidate, alternate, foreign, Relationships, Relational algebra operations– Union, Intersection, Difference, Cartesian Product, Selection, Projection, Join, Division, Additional Relational Operations, Examples of queries in the Relational Algebra.

UNIT – IV: 12 Hrs

Relational Database Language: DL and DML in SQL: DDL commands - create table/views/index, drop, alter, DML commands – select, insert, delete, update, etc., DCL commands – grant, revoke, commit, TCL commands, SQL – query, sub-query, nested query, Joins – natural, inner, outer join, aggregate functions in SQL.

**Textbook:**

1. RamezElmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, 5th Edition, Pearson Education, 2007.

**Reference Books:**

1. Abrahamsi. Silberschatz, Henry. F. Korth, S. Sudarshan, “Database System Concepts” 6th Edition, McGraw Hill, 2012.
2. C.J. Date, “Introduction to database systems”, Eight Edition, Addison Wesley.

|                        |                                 |          |          |          |          |
|------------------------|---------------------------------|----------|----------|----------|----------|
| <b>B19PS3061</b>       | <b>Physics in Everyday Life</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                                 | <b>4</b> | <b>0</b> | <b>0</b> | <b>4</b> |

**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/<br>COs | PO1      | PO2      | PO3      | PO4      | PO5 | PO6 | PO7 | PO8 | PSO1     | PSO2     |
|------------------|-------------|----------|----------|----------|----------|-----|-----|-----|-----|----------|----------|
| <b>B19PS3061</b> | <b>CO1</b>  | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |     |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO2</b>  | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |     |     |     |     | <b>3</b> | <b>2</b> |
|                  | <b>CO3</b>  | <b>3</b> | <b>2</b> | <b>2</b> | <b>2</b> |     |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO4</b>  | <b>3</b> | <b>3</b> | <b>2</b> | <b>2</b> |     |     |     |     | <b>3</b> | <b>2</b> |

**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 2019.
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.

|                        |                          |          |          |          |          |
|------------------------|--------------------------|----------|----------|----------|----------|
| <b>B19PS3070</b>       | <b>Physics Lab - III</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                          | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**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.

### Mapping of Course Outcomes with programme Outcomes

| Course Code      | POS/COs    | PO1      | P2       | PO3      | PO4      | PO5 | PO6 | P7 | PO8 | PSO1     | PSO2     |
|------------------|------------|----------|----------|----------|----------|-----|-----|----|-----|----------|----------|
| <b>B19PS3070</b> | <b>CO1</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |     |     |    |     | <b>3</b> | <b>1</b> |
|                  | <b>CO2</b> | <b>3</b> | <b>3</b> | <b>2</b> | <b>1</b> |     |     |    |     | <b>2</b> | <b>2</b> |
|                  | <b>CO3</b> | <b>3</b> | <b>3</b> | <b>2</b> | <b>2</b> |     |     |    |     | <b>2</b> | <b>1</b> |
|                  | <b>CO4</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>1</b> |     |     |    |     | <b>3</b> | <b>3</b> |

### 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

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

**Reference Books:**

- G.L.Souires, "Practical Physics:", 4th Edition, Cambridge University, UK, 2001.
- D. Chattopadhyay, P. C. Rakshit and B. Saha, "An Advanced Course in Practical Physics", 2nd ed., Books & Allied Ltd., Calcutta, 1990.
- Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)
- Practical Physics – S. L. Gupta & V. Kumar (PragatiPrakashan).

|                 |                     |   |   |   |   |
|-----------------|---------------------|---|---|---|---|
| B19PS3080       | 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:**

- Acquire skill in solving problems on Differential Equations using MAXIMA.
- 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:**

- Acquire proficiency in using Maxima to study Differential Equations.
- Demonstrate the use of Maxima to understand and interpret the core concepts in Differential Equations.
- 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 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS3080   | 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).

|                         |                  |          |          |          |          |           |
|-------------------------|------------------|----------|----------|----------|----------|-----------|
| <b>7) B19PS3090</b>     | <b>RDBMS Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> | <b>CH</b> |
| <b>Duration :14 Wks</b> |                  | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> | <b>3</b>  |

**Prerequisites:**

Sql, Domain types of sql, models.

**Course Objectives:**

The objectives of this course are to:

1. Have a good understanding of how several fundamental algorithms work, particularly those concerned with creation and updating of tables.
2. Have a good understanding of the fundamental DBMS used in computer science be able to understand various queries and their execution.
3. be able to design new database and modify existing ones for new applications and reason about the efficiency of the result

**Course Outcomes:**

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

1. To describe data models and schemas in DBMS
2. To use SQL- the standard language of relational databases.

3. To understand the functional dependencies and design of the database.
4. To understand the concept of Transaction and Query processing

### Mapping of Course Outcomes with programme Outcomes

| Course Code | POS/ COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS3090   | CO1      | 3   | 3   | 3   | 3   |     |     |     | 3   | 3    | 1    |
|             | CO2      | 3   | 3   | 2   | 1   |     |     |     | 1   | 2    | 2    |
|             | CO3      | 3   | 3   | 2   | 2   |     |     | 1   | 3   | 2    | 1    |
|             | CO4      | 3   | 3   | 3   | 1   |     |     |     | 3   | 3    | 3    |

|                         |
|-------------------------|
| <b>Course Contents:</b> |
|-------------------------|

#### PART – A

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

STUDENT (regno: int, name: string, dob: date, marks: int)

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

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

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

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

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

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

- i) Create the above table.
- ii) Enter the five tuples into the table
- iii) Display all the number of employees working in each department.
- iv) Find the sum of the salaries of all employees.
- v) Find the sum and average of the salaries of employees of a particular department.

vi) Find the least and highest salaries that an employee draws.

4. Consider the insurance database given below. The primary keys are underlined and the data types are specified.

PERSON(driver-id-no: string, name: string, address:string)

CAR(regno: string, model: string, year: int)

ACCIDENT(report-no: int, date: date, location: String)

OWNS(driver-id-no: string, regno: string)

PARTICIPATED(driver-id-no: string, regno: string, report-no: int, damage-amount: int)

i) Create the above tables by properly specifying the primary keys and the foreign keys

ii) Enter at least five tuples for each relation.

iii) Demonstrate how you

a) Update the damage amount for the car with a specific regno in the accident with report no 12 to 25000.

b) Add a new accident to the database.

iv) Find total number of people who owned cars that were involved in accidents in 2002

v) Find the number of accidents in which cars belonging to a specific model were involved

5. Consider the following database of students enrollment in courses and books adopted for each course.

STUDENT(regno: string, name: string, branch: string, bdate: date)

COURSE(course-no: int, cname: string, dept: string)

ENROLL(reg-no: string, course-no: int, sem: int, marks: int)

BOOK-ADOPTION(course-no: int, sem: int, book-isbn: int)

TEXT(book-isbn: int, book-title: string, publisher: string, author: string)

i) Create the above tables by properly specifying the primary keys and the foreign keys

ii) Enter at least five tuples for each relation.

iii) Demonstrate how you add a new text book to the database and make this book be adopted by some department.

iv) Produce a list of text books (include Course-no, book-isbn, book-title) in the alphabetical order for courses offered by the 'Compute Science' department that use more than two books.

v) List any department that has all its adopted books published by a specific publisher.

6. The following tables are maintained by a book dealer

AUTHOR(author-id: int, name: string, city: string, country: string)

PUBLISHER(publisher-id: int, name: string, city: string, country: string)

CATALOG(book-id: int, title:string,author-id:int, publisher-id:int, category:int, year:int, price: int)

CATEGORY(category-id: int, description: string)

ORDER-DETAILS(order-no: int, book-id: int, quantity: int)

i) Create above tables by properly specifying the primary keys and the foreign keys.

ii) Enter atleast five tuples for each relation.

iii) Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2010.

- iv) Find the author of the book which has maximum sales.
- v) Demonstrate how to increase price of books published by specific publisher by 10%

7. Consider the following database for BANK.

BRANCH(branch-name: string, branch-city: string, assets: real)

ACCOUNT(accno: int, banch-name: string, balance: real)

DEPOSITOR(customer-name: string, accno: int)

CUSTOMER(customer-name: string, customer-street: string, customer-city: string)

LOAN(loan-no: int, branch-name: string, amount: real)

ORROWER(customer-name: string, loan-no: int)

- i) Create the above tables by properly specifying the primary keys and foreign keys.
- ii) Enter atleast five tuples for each relation.
- iii) Find all the customers who have atleast two accounts at the main branch.
- iv) Find all customer who have an account at all the branches located in a specific city.
- v) Demonstrate how to delete all account tuples at every branch located in specific city.

8. Consider the following database for ORDER PROCEESING.

CUSTOMER(cust-no: int, cname: string, city: string)

ORDER(orderno: int, odate: date, ord-amt: real)

ORDER\_ITEM(orderno: int, itemno:int, qty: int)

ITEM(itemno: int, UNITprice: real)

SHIPMENT(orderno: int, warehouseno: int, ship-date: date)

WAREHOUSE(warehouseno: int, city: string)

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

## **PART – B**

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

Text Books:

1. “Database System Concepts” by Silberschatz, Korth, Sudarshan, 4th Edition, McGraw Hill Publication.

Reference Books:

1. “Database Systems, Concepts, Design and Applications” by S.K.Singh, Pearson Education.

2. “Database Management Systems” by Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Publication.

3. “Fundamentals of Database Systems” by Elmsari, Navathe, 5th Edition, Pearson Education (200







8. QÃvÀðÉÁxà PÃvÀðPÉsÃn, PÃÉÁðqÀ uÁ»vñ uÀAUÁw, ¥ÃPÃ±APÁgÃ PÃvÀðPÉsÃn vÉÁvÉsÃjAiÁÁeĩ l.riÖ, zÁgÁvÁqÀ. 2009
9. ±ÁvÁÁgÁAiÁÁ vÁ.uÁÁ, PÃÉÁðqÀ uÁ»vñ ZÁjvÉ, ¥ÃPÃ±APÁgÃ vÁÁÁQÉÁ vÉAPÁtÚAiÁÁ uÁÁgÁPÁ UÃAxÁvÁiÁeÉ, vÉÁÉuÁsgÁÁ -2014
10. uÁA. qÁ! ¹. Dgĩ. ZÁAzÁEÁRgĩ, vÁÁÁAzÁ¼ÁÁvÁÉAzÁ @PÃtUÁ¼ÁÁÁB ¨ÉÁÉ ¹PÉs¼ÁÁivÁczÁÁ °ÉÁUÉ?, ¥ÃPÃ±APÁgÃ ÉÁvÁPÃÉÁðI PÁ ¥Á©ÉÁuÁÉi ¥ÉÁvÉmĩ á«ÁmÉqĩ. 2010
11. DzÁÁcPÁ PÃÉÁðqÀ PÁvñ ¨ÁUÁ-2, PÃvÉA¥ÁÁ PÃÉÁðqÀ CzÁAiÁÁÉÁ uÁAuÉÜ, vÉÁÉuÁsgÁÁ «±Áé«zÁÁc©AiÁÁ, vÉÁÉuÁsgÁÁ. 2004
12. ²vÁgÁÁzÁÁeñ f. Juĩ. PÃÉÁðqÀ uÁ»vñ uÁ«ÁÁPÉ, ¥ÃPÃ±APÁgÃ uÁcÉÁð §ÁPi °Éüĩ, ¨ÉAUÁ¼ÁÁsgÁÁ. 2013

|                           |                           |          |          |          |          |
|---------------------------|---------------------------|----------|----------|----------|----------|
| <b>B19PS4012</b>          | <b>Language-II: Hindi</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14 Weeks</b> |                           | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**Prerequisites:**

- अधयेता को, हिन्दी खंिकव्य का संहिप्त ज्ञान आवश्यक िै ।
- हिन्दी साहित्य के इहतिास का संहिप्त ज्ञान की आवश्यकता िै ।
- हिन्दी व्याकरण का अवबोधन आवश्यक िै ।

**Course Objectives:**

1. संदर्रासुसार उहचत र्ाषा का प्रयोग करने की दित्ता को छात्ों में उत्पन्न करना ।
2. साहित्य के माध्यम से समाज एवं मानवीय मूल्ों को समझाकर, उन मूल्ों की रिा िेतु प्रेरित करना ।
3. छात्ों में पुस्तक पठन एवं लेखन की अकृ हतम प्रवृहि स्थाहपत करना ।
4. अधयेताओं में साहित्य के माध्यम से प्र्ावी एवं कु शल संचार का हवकास करना ।

**Course Outcomes:**

अध्ययन की समाप्तपत पर अधयेता –

1. सामाहजक मूल एवं नैहतक जवाबदेी को स्वीकार कर सकता िै ।
2. साहित्य की प्रासंहगकता को जीवन में समझने की दिता रखता िै ।
3. समाज में अंतहनहित पदहतयों एवं हवचारधाराओं का व्याख्यान करने में सिम बन सकता िै ।
4. साहित्य के माध्यम से प्र्ावी एवं कु शल संचार का हवकास कर सकता िै ।

**Mapping of Course Outcomes with programme Outcomes**

| Course Code      | POS/COs    | PO1 | P2 | PO3 | PO4 | PO5      | PO6      | P7       | PO8 | PSO1 | PSO2 |
|------------------|------------|-----|----|-----|-----|----------|----------|----------|-----|------|------|
| <b>B19PS4012</b> | <b>CO1</b> |     |    |     |     | <b>2</b> | <b>3</b> | <b>2</b> |     |      |      |
|                  | <b>CO2</b> |     |    |     |     | <b>2</b> | <b>2</b> | <b>3</b> |     |      |      |

|  |     |  |  |  |  |   |   |   |  |  |  |
|--|-----|--|--|--|--|---|---|---|--|--|--|
|  | CO3 |  |  |  |  | 3 | 3 | 3 |  |  |  |
|  | CO4 |  |  |  |  | 3 | 2 | 3 |  |  |  |

### Course Contents:

#### अध्ययन विषय विषय / पाठ्यक्रम

**इकाई – 1:** हिंदू काव्य – विषय की रचना – नरेक्ष महत्ता

अध्यापन अिसिया : 12 hrs.

किस परियथम िगा

सूततीय िगा

**इकाई – 2:** हिंदू काव्य – िशा

तप्रीय िगा

ित्तु िगा

**इकाई – 3:** हिंदू काव्य – िशा

पथिम िगा छठम िगा

िमि िगाय की रचना **अध्यापन अिसिया : 12 hrs.**

य की रचना

**अिसिया : 12 hrs.**

**इकाई – 4: व्याकरण :** अलंकार , सिसनमा ररव्यू

अध्यापन अिसिया : 12

hrs. व्याकरण : अलंकार

**सिसनमा ररव्यू :**

दगल , महादी मीसडयम, ियाह और िके देदुसडयं

#### विन्दभ ग्रन्थ :

- विषय की एक रचना – नरेक्ष महत्ता
- महादी िसहयय का इसतहाि – डॉ. नभर
- शिसनक महादी िसहयय का इसतहाि – डॉ. वरुन सिं
- महादी िसहयय का नणिीन इसतहाि – डॉ. लाल िसहब सिं
- शः महादी केरि कोले केरि कुरिणि- पृथ्वीनाथ पादे
- भारतीय िकुरसुत केरिओर – सिदुसनि िसमरु

- रामायण की कहानियाँ - हृषीकेश शर्मा
- रीति छंद और अलंकार - कृष्ण शर्मा और विश्व आश्रित

|                           |  |          |          |          |          |
|---------------------------|--|----------|----------|----------|----------|
| <b>B19PS4013</b>          |  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration: 14 Weeks</b> | <b>Language-II: Additional English</b> | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

### 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 |
|------------------|------------|-----|-----|-----|-----|----------|----------|----------|----------|------|------|
| <b>B19PS4013</b> | <b>CO1</b> |     |     |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |      |      |
|                  | <b>CO2</b> |     |     |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |      |      |
|                  | <b>CO3</b> |     |     |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |      |      |
|                  | <b>CO4</b> |     |     |     |     | <b>3</b> | <b>3</b> | <b>3</b> | <b>2</b> |      |      |

### 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: And 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.

|                          |                                 |          |          |          |          |
|--------------------------|---------------------------------|----------|----------|----------|----------|
| <b>B19PS4020</b>         | <b>Communicative English-II</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Weeks</b> |                                 | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**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:**

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 |
|------------------|------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS4020</b> | <b>CO1</b> |     |     |     |     | 3   | 3   | 3   | 2   |      |      |
|                  | <b>CO2</b> |     |     |     |     | 3   | 3   | 3   | 3   |      |      |
|                  | <b>CO3</b> |     |     |     |     | 3   | 3   | 3   | 2   |      |      |
|                  | <b>CO4</b> |     |     |     |     | 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 : Persuasive 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. Dixon, Robert J. *Everyday Dialogues in English*. Prentice Hall India Pvt Ltd., 1988.
5. Turton, Nigel D. *ABC of Common Errors*. Mac Millan Publishers, 1995.
6. Samson, T. (ed.) *Innovate with English*. Cambridge University Press, 2010.
7. Kumar, E Suresh, J. Savitri and P Sreehari (ed). *Effective English*. Pearson Education, 2009.

8. Goodale, Malcolm. *Professional Presentation*. Cambridge University Press, 2013.

|                          |                                  |          |          |          |          |
|--------------------------|----------------------------------|----------|----------|----------|----------|
| <b>B19PS4030</b>         | <b>Electricity and Magnetism</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Weeks</b> |                                  | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**B19PS4030Prerequisites:**

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/<br>COs | PO1      | PO2      | PO3      | PO4      | PO5 | PO6 | PO7 | PO8 | PSO1     | PSO2     |
|------------------|-------------|----------|----------|----------|----------|-----|-----|-----|-----|----------|----------|
| <b>B19PS4030</b> | <b>CO1</b>  | <b>3</b> | <b>2</b> | <b>1</b> | <b>1</b> |     |     |     |     | <b>3</b> | <b>2</b> |
|                  | <b>CO2</b>  | <b>3</b> | <b>2</b> | <b>3</b> | <b>2</b> |     |     |     |     | <b>3</b> | <b>2</b> |
|                  | <b>CO3</b>  | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |     |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO4</b>  | <b>3</b> | <b>2</b> | <b>2</b> | <b>2</b> |     |     |     |     | <b>3</b> | <b>2</b> |

**UNIT-I**



## Course contents

**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 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, 8<sup>th</sup> 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, 3<sup>rd</sup> edition, Prentice-Hall of India Private limited, New Delhi.
5. W.H. Hayt and J. A. Buck: Engineering Electromagnetism , 6<sup>th</sup> edition, Tata Mc Graw Hill, New Delhi.
6. V.K.Mehta & Rohit Mehta: Principles of Electronics, 11<sup>th</sup> edition, S.Chand & Co. Ltd.,

New Delhi.

7. BrijLal and N.Subrahmanyam : A text book of Electricity and Magnetism, 19<sup>th</sup> 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, 12<sup>th</sup> edition- S. Chand and Co. Ltd., New Delhi.

|                        |                       |          |          |          |          |
|------------------------|-----------------------|----------|----------|----------|----------|
| <b>B19PS4040</b>       | <b>Mathematics-IV</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14Wks</b> |                       | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**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 with vector 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/<br>Cos | PO1      | P02      | PO3      | PO4      | PO5 | PO6 | PO7      | PO8      | PSO1     | PSO2     |
|------------------|-------------|----------|----------|----------|----------|-----|-----|----------|----------|----------|----------|
| <b>B19PS4040</b> | CO1         | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |     |     | <b>1</b> | <b>3</b> | <b>3</b> | <b>3</b> |
|                  | CO2         | <b>3</b> | <b>2</b> | <b>1</b> | <b>2</b> |     |     | <b>1</b> | <b>2</b> | <b>3</b> | <b>3</b> |
|                  | CO3         | <b>3</b> | <b>2</b> | <b>2</b> | <b>2</b> |     |     | <b>1</b> | <b>2</b> | <b>3</b> | <b>3</b> |
|                  | CO4         | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |     |     | <b>1</b> | <b>3</b> | <b>3</b> | <b>3</b> |

**Course Contents:**

**Unit-I: Differential Calculus – 4**

**12 Hrs**

Limits and continuity, L- Hospital rule, Rolle's Theorem, 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's test, 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 irrotational 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 & Manicavachogam Pillay, Vector Algebra and Analysis, 4th ed.: S V Publishers, 1986.
- 2) Raisinghania Md, Saxena Hc, and Dass Hk, 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

|                        |   |          |          |          |          |
|------------------------|---|----------|----------|----------|----------|
| <b>B19PS4050</b>       | Operating Systems & Shell Programming Using LINUX | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14Wks</b> |   | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**Prerequisites:**

The basics of an operating system, knowing about computer organization and architecture, Memory management.

**Course Objectives:**

The objectives of this course are:

1. Enabling Knowledge: the operation, implementation and performance of modern operating

- systems, and the relative merits and suitability of each for complex user applications
2. Critical Analysis: Ability to compare, contrast, and evaluate the key trade-offs between multiple approaches to operating system design, and identify appropriate design choices when solving real-world problems
  3. Throughout the course, practical aspects that pertain to the most popular operating systems such as Unix/Linux and Windows, and some instructional operating systems will be studied
  4. To become familiar with the various commands of the Linux.
  5. To understand the scripting language of Unix / Linux.

### Course Outcomes:

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

1. Explain the objective and functions of modern operating systems.
2. Describe how computing resources are used by application software and managed by system software.
3. Implement the various filters of Unix / Linux.
4. Students will be created shared memory segments, pipes, message queues and can Exercise Interprocesses communication

### Mapping of Course Outcomes with programme Outcomes

| Course Code      | POS/COs    | PO1      | PO2      | PO3      | PO4      | PO5 | PO6 | PO7      | PO8      | PSO1     | PSO2     |
|------------------|------------|----------|----------|----------|----------|-----|-----|----------|----------|----------|----------|
| <b>B19PS4050</b> | <b>CO1</b> | <b>3</b> | <b>3</b> | <b>3</b> |          |     |     | <b>1</b> | <b>2</b> | <b>3</b> | <b>3</b> |
|                  | <b>CO2</b> | <b>3</b> | <b>3</b> | <b>2</b> | <b>2</b> |     |     |          | <b>2</b> | <b>3</b> | <b>1</b> |
|                  | <b>CO3</b> | <b>3</b> | <b>2</b> | <b>2</b> | <b>1</b> |     |     | <b>1</b> | <b>1</b> | <b>3</b> | <b>2</b> |
|                  | <b>CO4</b> | <b>3</b> | <b>2</b> | <b>2</b> | <b>2</b> |     |     | <b>2</b> | <b>2</b> | <b>3</b> | <b>2</b> |

### Course Contents:

#### UNIT-I

**12 Hrs**

Introduction: Definition, Types of Operating Systems, Functions of Operating System, services, system components System call. Process Management: Process Concept, Process Scheduling, Inter Process communication, CPU Scheduling Criteria, Scheduling algorithm, Multiple Processor Scheduling, Real time Scheduling.

#### UNIT – II

**12 Hrs**

Dead locks – system model, Characterization, Dead lock prevention, avoidance and detection, Recovery from dead lock, combined approach to deadlock handling. Memory management: Functions, single contiguous, Partitioned memory management: multiple relocatable partitioned memory management, paging, segmentation. Disk Management: Disk Structure & Scheduling methods, Disk management

**UNIT-III****12 Hrs**

History of Unix, salient features, Unix Components, types of shell, Internal and External commands, Files and File Organization- Categories of files, Unix file system, directories, file related commands, Directory related commands, wild cards, Printing and Comparing files. Ownership of files, File attributes File permissions and Manipulations, Standard I/O, Redirection, pipe, filter.

**UNIT-IV****12 Hrs**

Introduction to vi editor, The three modes of the vi editor, Invoking vi editor, Configuring the vi environment, Regular expressions, the grep command, The process - parent and child process, process creation, process related commands, Shell Programming - shell script features, shell variables, writing and executing a shell script, positional parameters, Branching control structures- if, case etc., Loop control structures – while, until, for, etc., Jumping control structures – break, continue, exit.

**Text Books:**

1. A. Silberschatz, P.B. Galvin and G. Gagne, Operating System Concepts.8th Edn, New Delhi: Wiley India, 2011.
2. Sumithaba Das – UNIX: Concepts and Applications

**Reference Books:**

1. Forouzan, “Unix and Shell Programming”, 1st Edition,2008 Cengage Learning India.
2. H.M. Deitel, “Operating Systems”, Pearson Learning Solutions, 5th Edition,
3. William Stallings, “Operating Systems”, 7th Edition, Pearson Education

|                        |                         |          |          |          |          |
|------------------------|-------------------------|----------|----------|----------|----------|
| <b>B19PS4070</b>       | <b>Physics Lab - IV</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                         | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**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/<br>COs | PO1 | P2 | PO3 | PO4 | PO5 | PO6 | P7 | PO8 | PSO1 | PSO2 |
|-------------|-------------|-----|----|-----|-----|-----|-----|----|-----|------|------|
| B19PS4070   | 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.

### 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).

|                        |                    |          |          |          |          |
|------------------------|--------------------|----------|----------|----------|----------|
| B19PS4080              | Mathematics Lab-IV | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                    | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**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 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS4080   | 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

|                        |           |   |   |   |   |
|------------------------|-----------|---|---|---|---|
| B19PS4090              | Linux Lab | L | T | P | C |
| <b>Duration:14 Wks</b> |           | 0 | 0 | 2 | 2 |

**Prerequisites:**

Operating systems, shell script, file system

**Course Objectives:**

The objectives of this course are to:

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

**Course Outcomes:**

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

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

**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/COs | PO1 | P2 | PO3 | PO4 | PO5 | PO6 | P7 | PO8 | PSO1 | PSO2 | PSO3 |
|-------------|---------|-----|----|-----|-----|-----|-----|----|-----|------|------|------|
| B19PS4090   | 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:**



### PART – A

1. Write a menu driven program to calculate (i) Simple interest (ii) Compound interest
2. To print all prime numbers between m and n ( $m < n$ ).
3. Reverse a given number and check whether it is palindrome or not.
4. Shell script to find maximum and minimum of given set
5. To count the number of vowels in each string.
6. To check whether a given string is a palindrome or not.
7. Write a shell script to generate and print the GCD and LCM of two integers.
8. Shell script to take two numbers as arguments and output their sum using (i) bc (ii) expr. Include error checking to test whether two arguments were entered.
9. Shell script to display all the file permissions.
10. 10. To write a shell script that creates a file and compresses it using: a) Compress b) pack

### PART – B

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

### Text Books

1. Unix System Programming using C++, T.Chan, PHI (Unit III to Unit VIII)
2. Unix Concepts and Applications, 4th Ed, Sumitabha Das, TMH
3. Unix Network Programming, W.R.Stevens, PHI.

### Reference Books

1. Beginning Linux Programming, 4th Edition, N. Matthew, R.Stones, Wrox, Wiley India Edition.
2. Unix for Programmers 3rd Ed, Graham Glass & King Ables, Pearson Education.
3. System Programming with C and Unix, A.Hoover, Pearson.
4. Unix System Programming, communication, concurrency and Threads, K.A. Robbins and S.Robbins, Pearson Education.

### Semester: V

|                        |                          |          |          |          |          |
|------------------------|--------------------------|----------|----------|----------|----------|
| <b>B19PS5010</b>       | <b>Quantum Mechanics</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14Wks</b> |                          | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

### Prerequisites:

Basic concepts 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.

|                         |
|-------------------------|
| <b>Course Outcomes:</b> |
|-------------------------|

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, harmonic 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 |
|------------------|------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS5010</b> | <b>CO1</b> | 3   | 3   | 2   | 3   | 2   |     |     |     | 2    | 1    |
|                  | <b>CO2</b> | 3   | 3   | 2   | 3   | 2   |     |     |     | 3    | 3    |
|                  | <b>CO3</b> | 3   | 3   | 1   | 3   | 2   |     |     |     | 3    | 2    |
|                  | <b>CO4</b> | 3   | 3   | 2   | 3   | 2   |     |     |     | 3    | 3    |

|                         |
|-------------------------|
| <b>Course Contents:</b> |
|-------------------------|

#### 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. Murugesan. (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

|                 |                |   |   |   |   |
|-----------------|----------------|---|---|---|---|
| B19PS5020       | 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
2. 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.
5. 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 |
|-------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS5020   | 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    |

|                         |
|-------------------------|
| <b>Course Contents:</b> |
|-------------------------|

**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 – 29 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.

|                        |                 |   |   |   |   |
|------------------------|-----------------|---|---|---|---|
| B19PS5030              | Mathematics -VI | L | T | P | C |
| <b>Duration:14 Wks</b> |                 | 1 | 1 | 0 | 2 |

|                       |
|-----------------------|
| <b>Prerequisites:</b> |
|-----------------------|

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’s method.
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 |
|-------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS5030   | 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 non homogeneous 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, non homogeneous linear equations, Non linear equations of the second order.

Unit-III: Rings and integral Domain 9Hrs  
 Definition and basic properties, Fields, Integral domains, divisors of zero and Cancellation laws,

Integral domains, The characteristic of a ring, some non – commutative rings, Examples, Matrices over a field, The real quaternions , , Homomorphism of Rings – Definition and 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.

| Course Code | Java Programming | Course Type | L | T | P | C |
|-------------|------------------|-------------|---|---|---|---|
| B19PS5040   |                  | HC          | 1 | 1 | 0 | 2 |

**Pre requisites:**

Prior knowledge of using the computers and basics programming concepts in software. Some experience in programming in C or C++, you can easily learn Java programming language

**Course Objectives**

The objectives of this course are to:

1. Able to understand the four pillars of Object orientation.
2. Understand the concepts of classes and objects.
3. Able to understand the concepts of Exception handling.

|                        |
|------------------------|
| <b>Course outcomes</b> |
|------------------------|

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

1. The students will have the competence in the use of Java Programming language.
2. Implement the concepts of classes with different types of inheritance.
3. Able to use the stream input and output.
4. Develop Java Program to store and retrieve data from the database.

| Course Code      | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS5040</b> | CO1     | 3   | 2   | 3   | 2   | 3   | 1   |     | 2   | 3    | 3    |
|                  | CO2     | 2   | 1   | 3   | 1   | 2   |     | 2   | 3   | 3    | 2    |
|                  | CO3     | 2   | 1   | 3   |     | 1   |     | 3   | 1   | 2    | 3    |
|                  | CO4     | 2   | 2   | 3   | 3   | 3   | 1   | 1   |     | 3    | 1    |

|                       |
|-----------------------|
| <b>Course Content</b> |
|-----------------------|

**UNIT – I**

**9 Hrs**

Introduction: History-Features of Java, How Java differs from C and C++-Java Environment-Structure of Java Program-Java Virtual Machine-Data Types-Constants-Variables-Declaration of variables-Giving values to variables-Scope of variables-Symbolic constants-Literals. Operators-Arithmetic, Boolean logical, Relational and Bitwise operators-Operator Precedence. Classes and Objects - General form of a class-Declaring objects-Accessing class members-Constructors-Parameterized constructors-Overloading constructors-Defining methods-Overloading methods, Introducing Access Control-Understanding static-Introducing Final-Garbage collection-finalize() method-this keyword.

**UNIT – II**

**9 Hrs**

Arrays & String Handling: Introduction to Arrays-One Dimensional Arrays-Creation of Arrays-Array Initialization Multidimensional Arrays-array name, Command Line Arguments. String Constructors-String length-String Literals-String Concatenation, String conversion and to String ()- Character Extraction- String Comparison-Searching Strings- Modifying a String- Data Conversion using value of ()-Changing the case of characters-String Buffer.

**UNIT – III****9 Hrs**

Inheritance : Basics-Member Access and Inheritance- Super class variable referring to a sub class- Applications of keyword super- Creating a Multilevel Hierarchy-Order of calling constructors- Method Overriding, Abstract classes-Using final with Inheritance. Defining an Interface - Implementing interfaces-Variables in interfaces-Extending interfaces.

**UNIT – IV****9 Hrs**

Exception Handling, Multithreading and IO Package: Introduction-Types of errors-Exception- Uncaught Exceptions - try and catch - Multiple catch - Nested Try - throw, throws and finally. Multithreaded Programming-Creating Threads-Life cycle of a Thread- Thread Priorities. I/O Basics-Streams-Byte Streams and Character Streams-Reading console Input-Reading Characters- Reading Strings-Writing console output.

**Text Book:**

1. Schildt Herbert, *Java: The Complete Reference*, 8th Edition, Tata McGraw- Hill, 2011 .

**Reference Books:**

1. E. Balagurusamy, *Programming with JAVA a Primer*, 4th Edition, 2010, Tata McGraw-Hill Publishing Company Limited, Delhi.
2. Patrick Naughton & Herbert Schildt, *JAVA 2: The Complete Reference*, TMH.

|                        |                                  |          |          |          |          |
|------------------------|----------------------------------|----------|----------|----------|----------|
| <b>B19PS5061</b>       | <b>Renewable Energy Resource</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14Wks</b> |                                  | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**Prerequisites:**

Basic concepts 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 domestic 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/<br>COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS5061</b> | <b>CO1</b>  | 3   | 3   | 2   | 3   | 2   |     |     |     | 2    | 1    |
|                  | <b>CO2</b>  | 3   | 3   | 2   | 3   | 2   |     |     |     | 3    | 3    |
|                  | <b>CO3</b>  | 3   | 3   | 1   | 3   | 2   |     |     |     | 3    | 2    |
|                  | <b>CO4</b>  | 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, 2<sup>nd</sup> edition, 2002.
2. S.P.Sukhatme: Solar Energy Principles & Thermal Collection & Storage, 2<sup>nd</sup> edn, TMH, New Delhi 2010.
3. G.D.Rai: Solar Energy Utilization, 5<sup>th</sup> edition, Khanna Publishers, New Delhi 2012.
4. G.D.Rai: Non-Conventional Energy sources, 4<sup>th</sup> edition, New Delhi 2010.
5. E.W.Golding: The Generation of Electricity (by wind) Prentice hall, New York 2007

|                          |                            |          |          |          |          |
|--------------------------|----------------------------|----------|----------|----------|----------|
| <b>B19PS5062</b>         | <b>Solid State Physics</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Weeks</b> |                            | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**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/<br>COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS5062</b> | <b>CO1</b>  | 3   | 2   | 2   | 2   | 2   |     |     |     | 3    | 1    |
|                  | <b>CO2</b>  | 3   | 3   | 2   | 2   | 1   |     |     |     | 3    | 2    |
|                  | <b>CO3</b>  | 3   | 3   | 2   | 2   | 1   |     |     |     | 3    | 1    |
|                  | <b>CO4</b>  | 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 13<sup>th</sup> edition
2. Arthur Beiser: Concepts of modern physics,6<sup>th</sup> edition, TMH, New Delhi.2008.
3. J.B. Blackmore: Introduction to solid state physics 2<sup>nd</sup> Edition reprint, Press Syndicate of the University of the Cambridge, United Kingdom, 1998
4. M A Wahab , solid state physics 2<sup>nd</sup> 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, 1<sup>st</sup> Edition, CBS Publishers and Distributors 2009
8. B B Laud, Lasers and Non-linear optics,2<sup>nd</sup> Edition, New age International, New Delhi.2004
9. B S Saxsena, R C Guptha and P N Saxsena, Fundamentals of Solid State Physics, 17<sup>th</sup> edition, PragathiPrakashana,Meerut 2000.

|                          |                              |          |          |          |          |
|--------------------------|------------------------------|----------|----------|----------|----------|
| <b>B19PS5063</b>         | <b>Semiconductor Physics</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Weeks</b> |                              | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**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/<br>COs | PO1 | P2 | PO3 | PO4 | PO5 | PO6 | P7 | PO8 | PSO1 | PSO2 |
|------------------|-------------|-----|----|-----|-----|-----|-----|----|-----|------|------|
| <b>B19PS5063</b> | <b>CO1</b>  | 3   | 2  | 2   | 2   | 1   |     |    |     | 3    | 1    |
|                  | <b>CO2</b>  | 3   | 3  | 2   | 2   | 1   |     |    |     | 3    | 2    |
|                  | <b>CO3</b>  | 3   | 3  | 2   | 2   | 1   |     |    |     | 3    | 1    |
|                  | <b>CO4</b>  | 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 Saxena, R C Guptha and P N Saxena, Fundamentals of Solid State Physics, 17<sup>th</sup> edition, P Prakashana, Meerut 2000.

|                        |                         |          |          |          |          |
|------------------------|-------------------------|----------|----------|----------|----------|
| B19PS5071              | <b>Complex Analysis</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                         | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**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 | PSO2 |
|-------------|------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS5071   | <b>CO1</b> | 3   | 2   | 2   | 2   | 1   |     |     |     | 3    | 1    |
|             | <b>CO2</b> | 3   | 3   | 2   | 2   | 1   |     |     |     | 3    | 2    |
|             | <b>CO3</b> | 3   | 3   | 2   | 2   | 1   |     |     |     | 3    | 1    |
|             | <b>CO4</b> | 3   | 3   | 2   | 2   | 1   |     |     |     | 3    | 1    |

## Course Contents:

### Unit-I: Complex Analysis – 1

6

#### Hrs

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

### Unit-II: Complex Analysis – 2

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 its consequences. 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 Churchill & 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>

|                        |                |   |   |   |   |
|------------------------|----------------|---|---|---|---|
| B19PS5072              | Fluid Dynamics | L | T | P | C |
| <b>Duration:14 Wks</b> |                | 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 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS5072   | 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, acceleration, rectilinear motion, rectilinear motion with constant acceleration, relative angular velocity, work, power, energy.

**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 Batchelor, 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.

|                        |               |          |          |          |          |
|------------------------|---------------|----------|----------|----------|----------|
| B19PS5073              | Number Theory | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |               | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**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 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS5073   | 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    |

|                         |
|-------------------------|
| <b>Course Contents:</b> |
|-------------------------|

**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.

|                    |                        |          |          |          |          |
|--------------------|------------------------|----------|----------|----------|----------|
| <b>Course Code</b> |                        | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>B19PS5081</b>   | <b>Web Programming</b> | 2        | 0        | 0        | 2        |

**Prerequisites:**

Front-end includes user interaction whereas Back-end involves server side coding i.e. Data interaction. In Front end Developer most important languages are HTML, CSS and JavaScript.

**Course Objectives:**

1. Understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
2. Develop skills in analyzing the usability of a web site
3. Learn techniques of responsive web design
4. Develop basic programming skills using Javascript

**Course Outcomes:**

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

**Mapping of Course Outcomes with programme Outcomes**

| Course Code      | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS5081</b> | CO1     | 1   |     |     | 3   | 2   | 2   | 2   | 2   | 1    | 3    |
|                  | CO2     | 2   | 1   | 1   | 3   | 1   | 1   | 1   | 1   | 1    | 3    |
|                  | CO3     | 3   | 1   | 2   | 2   | 3   |     | 1   | 2   | 2    | 3    |
|                  | CO4     | 2   | 2   | 2   | 2   | 1   |     | 3   | 1   | 2    | 3    |

**Course Contents:**

**UNIT - I**

**6 Hrs**

Fundamentals of Web: Internet, WWW, Web Browsers, and Web Servers, URLs. XHTML: Origins and evolution of HTML and XHTML, Basic syntax, Standard XHTML document structure, Basic text markup, Images, Hypertext Links, Lists, Tables, Forms, Frames, Syntactic differences between

HTML and XHTML.

**UNIT - II**

**6 Hrs**

Java Script: Overview of JavaScript; Primitives, Operations, and expressions; Screen output and keyboard input; Control statements; Object creation and Modification; Arrays; Functions; Constructor; Examples

**UNIT - III**

**6 Hrs**

Java Script and HTML Documents, Dynamic Documents with JavaScript, The JavaScript execution environment Element access in JavaScript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; Element visibility; Changing colors and fonts; Dynamic content;

**UNIT - IV**

**6 Hrs**

CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The Box model, Background images, The <span> and <div> tags. Conflict resolution.

**Text Books:**

1. Robert W Sebesta, "Programming the World Wide Web", 4th Edition, Pearson Education,

**Reference Books:**

1. M.Deitel, P.J.Deitel, A.B.Goldberg, "Internet & World Wide Web How to program", 4th Edition, Pearson Education / PHI,
2. Chris Bates, "Web Programming Building Internet Applications", 4th Edition, Wiley India,

|                    |                           |          |          |          |          |
|--------------------|---------------------------|----------|----------|----------|----------|
| <b>Course Code</b> | <b>Visual Programming</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>B19PS5082</b>   |                           | 2        | 0        | 0        | 2        |

**Prerequisites:**

Working environment is Visual Studio, C Sharp, basic knowledge about C or Java, knowledge of HTML and CSS

**Course Objectives:**

1. To introduce the concepts of visual programming.
2. To introduce GUI programming using Microsoft foundation classes.
3. To enable the students to develop programs and simple application using Visual Basic.

**Course Outcomes:**

1. Incorporate programming control structures of sequence, selection and iteration using Visual Basic.
2. Create and manipulate variables.
3. Design forms by using various controls like labels, textbox, command button etc.
4. Use events and methods of visual basic objects.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code      | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | P7 | PO8 | PSO1 | PSO2 |
|------------------|---------|-----|-----|-----|-----|-----|-----|----|-----|------|------|
| <b>B19PS5082</b> | CO1     | 2   | 2   | 1   | 2   | 3   | 3   | 3  | 1   | 3    | 3    |
|                  | CO2     | 1   | 3   | 3   | 3   | 3   |     | 3  |     | 3    | 3    |
|                  | CO3     | 3   | 3   | 3   |     | 3   |     | 3  | 2   | 3    | 3    |
|                  | CO4     | 3   | 3   | 3   | 1   | 3   | 3   |    |     | 3    | 3    |

**UNIT – I****6 Hrs**

Introduction to Visual Programming: Features of Visual Basic, Advantages and Disadvantages of Visual Basic, Types of Visual Basic Applications, The Integrated Development Environment (IDE). A standard EXE Project: Title bar, Menu bar, Tool bar. Windows: Project Window, Form Designer Window, ToolBox, Properties Window, Form Layout Window. Form Object and Controls: Form Object, Control Menu, MinButton and MaxButton, Title Bar, Moveable, StartUpPosition, WindowState. Form Properties: Name, Caption, Back color, Border style, Height, Width, Scalemode, Forecolor, Font, Visible etc. Form Events –Load, Unload, Click. Form Methods – Show, Hide, Cls, Print Form. Intrinsic Controls: Adding and Removing Control.

**UNIT – II****6 Hrs**

Properties and Events of Different Controls- Label, Command Buttons, TextBox, Frame, Option Button, Check Box, Combo Box, List Box, Picture Box, Image Box, Timer Control, ScrollBars, MM Controls. Predefined Dialog Boxes: MsgBox and InputBox. Programming in VB: Event-Driven Programming, Types of Events, Writing Event Procedures, Common Events-Mouse Events, Keyboard Events and Focus Events.

**UNIT – III****6 Hrs**

Looping Structures: Entry-Controlled and Exit- Controlled, Do-Loop, While-Wend, For-Next. Functions, Built-In Functions-Numeric Functions, Formatting Functions, String Functions and Date Functions. Creating and calling Functions. Arguments: Passing Arguments By Value, Passing Arguments By Reference. Modules. Designing Menus: The Menu Editor, Menu Editor Properties, Designing Multiple Document Interface forms (MDI Forms).

**UNIT – IV****6 Hrs**

Microsoft Common Controls: Date Time Picker, Common Dialog, Database Connectivity – Introduction, ADO Data Control (ADODC), Data Grid Control, Properties Methods and Events of ADO Data Control. Common Properties of Data Aware Controls: Data Source, Data Field, Data Format and Data Member. Methods: AddNew, Update, Delete, Edit, Refresh and Find Methods. Navigation Methods: MoveFirst, MoveLast, MovePrevious, MoveNext.

**Text Books:**

1. Gurumit Singh, “Visual Basic 6”, First Edition, Firewall Media, 2007.

**Reference Books:**

1. "Visual Basic 6.0 Complete Reference". Tata McGraw-Hill
2. Gottfried, "Programming with Visual Basic 6", PHI, 2000.

| Course Code      | Computer Graphics | L | T | P | C |
|------------------|-------------------|---|---|---|---|
| <b>B19PS5083</b> |                   | 2 | 0 | 0 | 2 |

**Prerequisites:**

Analytic geometry, Linear algebra (vector, matrix), Knowledge of C++ is not necessary but is helpful.

**Course Objectives:**

1. This course is designed to provide a comprehensive introduction to computer graphics.
2. Introduction to computer graphics techniques, focusing on 2D modelling.
3. Introduction to 3D modelling and graphics techniques.

**Course Outcomes:**

1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
2. Use of geometric transformations on graphics objects and their application in composite form.
3. Extract scene with different clipping methods and its transformation to graphics display device.
4. describe the fundamentals of animation, parametric curves and surfaces, and spotlighting

**Mapping of Course Outcomes with programme Outcomes**

| Course Code      | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS5063</b> | CO1     | 2   | 1   | 3   | 2   | 2   | 3   |     | 3   | 2    | 3    |
|                  | CO2     | 2   | 1   | 2   | 3   | 3   | 2   |     |     | 3    | 3    |
|                  | CO3     | 1   | 1   | 2   | 3   | 1   |     | 2   | 3   | 3    | 2    |
|                  | CO4     | 1   | 1   | 2   | 2   | 3   |     | 3   |     | 2    | 2    |

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

Graphics Systems: Application of CG, CRT Functioning- Factors Affecting CRT- Raster scan System– Shadow mask method, Output Primitives Line drawing methods-DDA and Bresenhams, line attributes,-Circle drawing-Direct and mid-point circle drawing.

**UNIT – II****6 Hrs**

Two Dimensional Transformation: Basic Transformation, Translation, Rotation, Scaling-Reflection and Shear matrix representations- Homogeneous co-ordinates- composite transformation

**UNIT – III****6 Hrs**

Windowing and Clipping: Viewing Transformations, Clipping process, Point clipping, Line Clipping, Cohen Sutherland line clipping algorithm, Midpoint Subdivision algorithm, Text clipping.

**UNIT – IV****6 Hrs**

Three Dimensional Graphics: 3D-coordinate system,3D-Display techniques,3D-transformations, Octrees, Bezier curves. Graphical Input Techniques: Positioning techniques Gravity field, Rubber band, Selection technique, Menu, Pointing and selection by naming.

**Text Books:**

1. Donald Hearn & M. Pauline Baker, Computer Graphics C version, PHI1990
2. Steven Harrington, Computer Graphics, MCGH.

**Reference Books:**

1. Newman & Sproull, Principles of Interactive Computer Graphics, McGrawHill.
2. Yeshwant Kanetkar, Graphics under C, BPB publications

|                        |                       |          |          |          |          |
|------------------------|-----------------------|----------|----------|----------|----------|
| <b>B19PS5X10</b>       | <b>Physics lab- V</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :16Wks</b> |                       | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**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

### Mapping of Course Outcomes with programme Outcomes

| Course Code           | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-----------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS5<br/>X10</b> | CO1     | 3   | 3   | 3   | 2   |     |     |     |     | 2    | 3    |
|                       | CO2     | 3   | 3   | 3   | 2   |     |     |     |     | 3    | 3    |
|                       | CO3     | 2   | 2   | 1   | 3   |     |     |     |     | 3    | 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).

|                        |                        |          |          |          |          |
|------------------------|------------------------|----------|----------|----------|----------|
| <b>B19PS5X20</b>       | <b>Physics lab- VI</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :16Wks</b> |                        | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**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

### Mapping of Course Outcomes with programme Outcomes

| Course Code           | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-----------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS5<br/>X10</b> | CO1     | 3   | 3   | 3   | 2   | 2   |     |     |     | 2    | 3    |
|                       | CO2     | 3   | 3   | 3   | 2   | 2   |     |     |     | 3    | 3    |
|                       | CO3     | 2   | 2   | 1   | 3   | 2   |     |     |     | 3    | 2    |

### Lab Experiments

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 characteristics 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).

|                        |                             |          |          |          |          |
|------------------------|-----------------------------|----------|----------|----------|----------|
| <b>B19PS5X30</b>       | <b>Java Programming Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :16Wks</b> |                             | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

Basic

#### Prerequisites:

knowledge of computer fundamentals

Student must have knowledge of some programming languages (such as C , C++)

#### Course Objectives:

The objectives of this course are to:

1. To understand object-oriented programming concepts and apply them in problem solving.
2. To learn the basics of java Console, GUI based programming and networking programming.

|                         |
|-------------------------|
| <b>Course Outcomes:</b> |
|-------------------------|

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

1. Understanding of OOP concepts and basics of Java programming (Console and GUI based).
2. The skills to apply OOP and Java programming in problem solving.
3. Should have the ability to extend his/her knowledge of Java programming further on his/her own.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code           | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-----------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS5<br/>X30</b> | CO1     | 3   | 3   | 3   | 2   | 2   |     | 2   | 2   | 2    | 3    |
|                       | CO2     | 3   | 3   | 3   | 2   | 2   |     | 2   | 2   | 3    | 3    |
|                       | CO3     | 2   | 2   | 1   | 3   | 2   |     | 2   | 3   | 3    | 2    |

|                        |
|------------------------|
| <b>Lab Experiments</b> |
|------------------------|

**PART – A**

1. Write a program to find factorial of list of number reading input as command line argument.
2. Write a program to display all prime numbers between two limits.
3. Write a program to implement all string operations.
4. Implementation of super and this.
5. Implementation of static variables and methods.
6. Write a program to find area of geometrical figures using abstract method.
7. Write a program to implement constructor overloading by passing different number of parameter of different types.
8. Write a program to calculate bonus for different departments using method overriding.
9. To implement multithreading by extending Thread class
10. Write a program to sort list of elements in ascending and descending order and show the exception handling.

**PART – B**

During practical examination the External and Internal examiners may prepare exam question

paper related to theory syllabus apart from Part-A. (A minimum of 10 Programs has to be prepared).

|                        |                            |          |          |          |          |
|------------------------|----------------------------|----------|----------|----------|----------|
| <b>B19PS5X40</b>       | <b>Web Programming Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :16Wks</b> |                            | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**Prerequisites:**

Knowledge of C programming Lab

**Course Objectives:**

The objectives of this course are to:

1. To understand the need of developing graphics application
2. To learn algorithmic development of graphics primitives like: line, circle, polygon etc.
3. To learn the representation and transformation of graphical images and pictures.

**Course Outcomes:**

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

1. Draw Geometric primitives
2. Execute scan line polygon filling
3. Implement basic transformations on objects
4. Represent graphical images and pictures.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code      | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS5X40</b> | CO1     | 1   | 1   | 2   | 3   | 2   | 1   | 2   | 1   | 2    | 1    |
|                  | CO2     | 2   | 2   | 2   | 3   | 2   | 2   | 2   | 2   | 2    | 2    |
|                  | CO3     | 1   | 2   | 1   | 3   | 3   | 3   | 1   | 1   | 1    | 2    |
|                  | CO4     | 1   | 2   | 1   | 3   | 3   | 3   | 1   | 1   | 1    | 2    |

**Lab Experiments**

**PART – A**

1. DDA technique to draw Straight line
2. DDA technique to draw circle

3. Bresenham's techniques to draw Straight line
4. Bresenham's techniques to draw circle
5. Pie chart depiction of the results of an election between four parties.
6. Transform a triangle and illustrate reflection, translation, rotation and scaling.
7. Clipping the triangle ABC against a window.
8. Animate a man walking with umbrella
9. Animate shadow of a pole as sun moves
10. Animate India National flag

### PART – B

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

|                        |                               |          |          |          |          |
|------------------------|-------------------------------|----------|----------|----------|----------|
| <b>B19PS5X50</b>       | <b>Visual Programming Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :16Wks</b> |                               | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

#### Prerequisites:

Basics on C, C++ and Java Programming

#### Course Objectives:

The objectives of this course are to:

1. This course introduces computer programming using the Visual BASIC programming language with object-oriented programming principles.
2. The objective of this course is to make the student to learn how to design, code, test and debug programs using VC++ and VB.

#### Course Outcomes:

On completion of this course the student shall be able :

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

4. To debug programs using VC++ and VB

**Mapping of Course Outcomes with programme Outcomes**

| Course Code           | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-----------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS5<br/>X50</b> | CO1     | 2   | 1   | 2   | 2   | 2   | 1   | 1   | 1   | 1    | 2    |
|                       | CO2     | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 1   | 2    | 3    |
|                       | CO3     | 1   | 2   | 3   | 3   | 3   | 1   | 1   | 1   | 3    | 3    |
|                       | CO4     | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 1   | 2    | 3    |

**Lab Experiments**

**PART – A**

1. Design a User Interface (UI) to accept the student details such as name, department and total marks. Validate the input data and calculate the percentage and division.
2. Write a VB Program to design a simple calculator to perform addition, subtraction, multiplication and division (Use functions for the calculations).
3. Design a small Alarm Clock Application.
4. VB program to Encrypt and Decrypt a string. (Use Rnd() to generate the Encryption and decryption keys).
5. Create a Vending machine application, that display images for four snacks and corresponding labels that indicates the number for each snack. The GUI should contain a text box in which the user specifies the number of desired snack. When the dispense snack button is clicked, it should display on a label the name of the snack dispensed. At end it should print (display) the bill of the product.
6. Design a VB application which has MDI and Child forms. Create a menu having the items such as file (New, Open), Format (Font, Regular, Bold, Italic) and Exit in the MDI form. also create a text box and use a Common Dialog Box control for changing the font, Fore Color and Back Color of the Text Box.
7. VB program to create a sequential file containing the fields name, address, city, pin code and phone number. Display the records in a neat format.

8. Write a VB Program to Validate the username and password form the database and display the appropriate message.(Use Data Control)
9. Design a VB application to accept the Item Details (Item ID, Item Name, MFD Date, UNIT Of measure and Rate Per UNIT).Item Id should be a system generated ID. The application should allow operations –Add, Modify, Delete, Update and Navigations of the items. Use ADO Data controls and Grid controls.
10. Design a VB application to record the employee details such as EmpId, EmpName, designation and Basic Pay. Calculate the DA, HRA, Deduction and Gross Salary. (Make the necessary assumptions).

**PART – B**

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

10. Create a web page using two image files, which switch between one another as the mouse pointer moves over the image. Use the on Mouse Over and on Mouse Out event handlers.

**PART – B**

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

|                        |                              |          |          |          |          |
|------------------------|------------------------------|----------|----------|----------|----------|
| <b>B19PS5X60</b>       | <b>Computer Graphics Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :16Wks</b> |                              | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**Prerequisites:**

Basics on C, C++ and Java Programming

**Course Objectives:**

The objectives of this course are to:

1. This course introduces computer programming using the Visual BASIC programming language with object-oriented programming principles.
2. The objective of this course is to make the student to learn how to design, code, test and debug programs using VC++ and VB.

## Course Outcomes:

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

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

### Mapping of Course Outcomes with programme Outcomes

| Course Code           | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-----------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS5<br/>X60</b> | CO1     | 2   | 1   | 2   | 2   | 2   | 1   | 1   | 1   | 1    | 2    |
|                       | CO2     | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 1   | 2    | 3    |
|                       | CO3     | 1   | 2   | 3   | 3   | 3   | 1   | 1   | 1   | 3    | 3    |
|                       | CO4     | 1   | 2   | 3   | 3   | 3   | 1   | 1   | 1   | 3    | 3    |

## Lab Experiments

### PART – A

11. Design a User Interface (UI) to accept the student details such as name, department and total marks. Validate the input data and calculate the percentage and division.
12. Write a VB Program to design a simple calculator to perform addition, subtraction, multiplication and division (Use functions for the calculations).
13. Design a small Alarm Clock Application.
14. VB program to Encrypt and Decrypt a string. (Use Rnd() to generate the Encryption and decryption keys).
15. Create a Vending machine application, that display images for four snacks and corresponding labels that indicates the number for each snack. The GUI should contain a text box in which the user specifies the number of desired snack. When the dispense snack button is clicked, it should display on a label the name of the snack dispensed. At end it should print (display) the bill of the product.
16. Design a VB application which has MDI and Child forms. Create a menu having the items such as file (New, Open), Format (Font, Regular, Bold, Italic) and Exit in the MDI form. also create a



text box and use a Common Dialog Box control for changing the font, Fore Color and Back Color of the Text Box.

17. VB program to create a sequential file containing the fields name, address, city, pin code and phone number. Display the records in a neat format.
18. Write a VB Program to Validate the username and password form the database and display the appropriate message.(Use Data Control)
19. Design a VB application to accept the Item Details (Item ID, Item Name, MFD Date, UNIT Of measure and Rate Per UNIT).Item Id should be a system generated ID. The application should allow operations –Add, Modify, Delete, Update and Navigations of the items. Use ADO Data controls and Grid controls.
20. Design a VB application to record the employee details such as EmpId, EmpName, designation and Basic Pay. Calculate the DA, HRA, Deduction and Gross Salary. (Make the necessary assumptions).

**PART – B**

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

10. Create a web page using two image files, which switch between one another as the mouse pointer moves over the image. Use the on Mouse Over and on Mouse Out event handlers.

**PART – B**

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

**Semester VI:**

|                        |                        |          |          |          |          |
|------------------------|------------------------|----------|----------|----------|----------|
| B19PS6010              | <b>Nuclear Physics</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                        | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**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 |
|-------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS6010   | 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, deuteron and  $\alpha$ -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, 6<sup>th</sup> edition, TMH, New Delhi.2008.
2. Irving Kaplan: Nuclear Physics, 2<sup>nd</sup> edition, Narosa Publishing House, 1987(Reprint2002).
3. K. S. Krane: 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 Physics 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. Krane: Introductory Nuclear Physics, Wiley India, 2008
10. M K PAL , Theory of Nuclear Structure, East-West Press Delhi (1983).

|                        |                   |   |   |   |   |
|------------------------|-------------------|---|---|---|---|
| B19PS6020              | Numerical Methods | L | T | P | C |
| <b>Duration:14 Wks</b> |                   | 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.

|                         |
|-------------------------|
| <b>Course Outcomes:</b> |
|-------------------------|

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 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS6020   | 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    |

|                         |
|-------------------------|
| <b>Course Contents:</b> |
|-------------------------|

**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.

| Course Code      |                             | L | T | P | C |
|------------------|-----------------------------|---|---|---|---|
| <b>B19PS6030</b> | <b>Software Engineering</b> | 1 | 1 | 0 | 2 |

**Prerequisites:**

Software development lifecycle: analyses, design, program, control.

**Course Objectives:**

1. To provide students an in depth understanding of software engineering principles.
2. To prepare the students to develop the skills necessary to handle software projects.
3. To make the students aware of the importance of software engineering principles in designing software projects.

**Course Outcomes**

1. Understand the importance of the stages in the software life cycle.
2. Understand the various process models.
3. Be able to design software by applying the software engineering principles.
4. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code      | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS6030</b> | CO1     | 3   | 2   | 3   | 1   |     |     |     |     | 3    | 2    |
|                  | CO2     | 2   | 2   | 3   | 1   |     |     | 3   | 2   | 2    | 3    |
|                  | CO3     | 3   | 3   | 3   | 2   | 3   | 2   | 2   | 2   | 3    | 3    |
|                  | CO4     | 2   | 2   | 3   | 3   |     |     | 3   |     | 3    | 2    |

**Course Content**

**UNIT – I**

**9 Hrs**

Software and Software Engineering Nature of software- Defining software, Software Application Domains, Legacy Software, Software Engineering, The software process, Software Engineering practice, The essence of Practice, General Principles, Software Myths. Process models A generic process model, Defining a framework activity, identifying a Task Set, Process Patterns, Process Assessment and improvement, Prescriptive Process Models, The waterfall Model, Incremental Model, Evolutionary Process Model, Concurrent Models, Introduction about Agile methodology.

**UNIT – II**

**9 Hrs**

Understanding Requirements: Requirements Engineering, Establishing the groundwork, Identifying Stakeholders, Recognizing multiple viewpoints, Working toward Collaboration, Asking the first questions, Eliciting requirements, Collaborative requirement gathering, Quality function Deployment, Usage Scenario Elicitation Work Products, Developing use cases, building the requirements model, Elements of the requirements Model, Analysis pattern, Negotiating requirements, validating requirements. Requirement Modelling Requirement Analysis, Data modelling concepts, Class-based modelling, Requirement modelling strategies, Flow oriented modelling.

**UNIT – III****9 Hrs**

Design Concepts: The design within the context of Software Engineering, The design process, Software quality guidelines and attributes, The evolution of software design, Design concepts, Abstraction, Architecture, Patterns, Separation of concerns, Modularity, information hiding, Functional Independence, refinement, Aspects, Refactoring, Object Oriented design concepts Design classes, The design Model, Data Design elements, Architectural Design elements, Interface Design Elements, Component-Level Design elements, Deployment level Design elements. User Interface Design The golden rules- Place the User in Control, Reduce the User's Memory load, Make the interface Consistent, Interface Analysis and Design models, The Process, Interface Analysis User Analysis, Task Analysis, Analysis of Display Content, Analysis of the Work Environment, Interface design steps, Applying Interface Design steps, User Interface design patterns, Design Issues.

**UNIT – IV****9 Hrs**

Quality Management: Introduction, Software quality, Achieving software quality, Review metrics and their use, Informal reviews, Formal technical reviews, SQA tasks, Goals and metrics, Formal approaches to SQA, Statistical Software quality assurance, Software Reliability, SQA plan.

**Text Books:**

1. Roger S. Pressman – Software Engineering, A Practitioner’s approach, 7th Edn, TMH Publication, 2010.
2. Ian Sommerville – Software Engineering, 9th Edition, Pearson Education Ltd, 2010.

**Reference Books:**

1. Pankaj Jalote, “An integrated approach to Software Engineering”, 3rd Edition, Narosa Publishing House, 2013.
2. Rumbaugh, James. *Object Oriented Modeling and design*, Pearson Education, New Delhi, 2005.

|                        |                          |          |          |          |          |
|------------------------|--------------------------|----------|----------|----------|----------|
| B19PS6041              | <b>Physics of Clouds</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                          | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**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 lightning.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS6041   | 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, Claius-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.

|                        |                      |          |          |          |          |
|------------------------|----------------------|----------|----------|----------|----------|
| B19PS6042              | <b>Astro Physics</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                      | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**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 |
|-------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
|             |          |     |     |     |     |     |     |     |     |      |      |

|           |     |   |   |   |   |   |  |  |  |   |   |
|-----------|-----|---|---|---|---|---|--|--|--|---|---|
| B19PS6042 | 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.

|                        |  |          |          |          |          |
|------------------------|--|----------|----------|----------|----------|
| B19PS6043              | <b>Digital Electronics and Communication</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |  | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

#### 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 |
|-------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS6043   | 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

|                        |                   |   |   |   |   |
|------------------------|-------------------|---|---|---|---|
| B19PS6051              | Fuzzy Mathematics | L | T | P | C |
| <b>Duration:14 Wks</b> |                   | 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 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS6051   | 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

|                        |          |          |          |          |          |
|------------------------|----------|----------|----------|----------|----------|
| B19PS6052              | Topology | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |          | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**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 | PSO2 |
|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS6052   | 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

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  $S^1$  and  $S^n$ . 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.

|                 |                                       |   |   |   |   |
|-----------------|---------------------------------------|---|---|---|---|
| B19PS6053       | 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 |
|-------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| B19PS6053   | 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: Graph 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 disconnected graphs, Components, Euler graphs, Operation on graphs, Hamiltonian paths, Circuits, Trees and some properties of trees, Rooted and binary tree, Spanning tree and fundamental circuits.

**Unit-IV: Graph Theory -2****6 Hrs**

Cutsets, Properties, Fundamental cut sets, Connectivity, Separability, Planar graphs, Kuratowski's 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 3rd edition 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

**Reference Books:**

1. Narsing Deo: Graph Theory & Applications (PHI), India.
2. Frank Harary: Graph Theory Narosa Publications, India.

|                        |                          |          |          |          |          |
|------------------------|--------------------------|----------|----------|----------|----------|
| B19PS6030              | <b>Computer Networks</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                          | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**Prerequisites:**

Data communications, digital transmissions, Protocols, Layers.

**Course Objectives:**

1. To study about network components.
2. To study about topologies and network models.
3. To study about various network protocols.

**Course Outcomes:**

4. Recognize the technological trends of Computer Networking.
5. Discuss the key technological components of the Network.
6. Evaluate the challenges in building networks and solutions to those.



7. Explain the way protocols currently in use in the Internet work and the requirements for designing network protocols.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code           | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|-----------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS60<br/>30</b> | CO1     | 3   | 2   |     |     |     | 1   | 2   | 2   | 1    | 2    |
|                       | CO2     | 3   | 2   | 1   | 1   | 1   | 1   | 2   | 2   | 1    | 2    |
|                       | CO3     | 3   | 2   | 2   | 1   | 2   | 1   | 2   | 2   | 1    | 2    |
|                       | CO4     | 3   | 2   | 2   | 2   | 2   | 1   | 2   | 2   | 1    | 2    |

**Course Contents:**

**UNIT-I**

**6 Hrs**

Physical Layer: Data communications: components – Network criteria – physical structures – network models – categories of networks –interconnection of networks – inter network Protocols and standards: protocols-standards-standards organizations- internet standards Network models: Layered tasks – OSI model – layers in the OSI model – TCP/IP protocol suite.

**UNIT-II**

**6 Hrs**

Digital Transmission: Digital to digital conversion: Line coding – line coding schemes – block coding - analog to digital conversion – PCM - transmission modes: serial transmission – parallel transmission Analog Transmission: Digital to analog conversion: FSK-ASK-PSK Analog to Analog conversion: Amplitude modulation – Frequency modulation – phase modulation.

**UNIT-III**

**6 Hrs**

Data Link Layer: Error correction and detection: Introduction- block coding-linear block codes-cyclic codes- checksum. Data link Control: protocols-simplest protocol- stop and wait protocol-stop and wait automatic repeat request-go back n automatic repeat request-selective repeat-automatic repeat request- piggybacking. Multiple Access: Random access-Aloha-CSMA-CSMA/CD-CSMA/CA Controlled access: reservation, polling, token passing. Channelization: FDMA, TDMA, CDMA.

**UNIT-IV**

**6 Hrs**

Network Layer: Addressing IPV4 addresses - IPV6 Addresses Internet Protocol: IPv4 –IPv 6 Address mapping protocols: ARP – RARP. Routing protocols: Unicast routing protocols:

distance vector routing, Link State routing Multicast Routing protocols (Any two) Transport Layer: Process to process delivery – UDP – TCP Congestion control and QOS: Data traffic – congestion – congestion control – quality of service – techniques to improve quality of service.

**Text Books:**

1. Behrouz. A. Forouzan, *Data communication and networking*, McGraw-Hill, 5th edition, 2011.

**Reference Books:**

Andrew. S. Tanenbaum, *Computer Networks*, PHI publications, 5th edition, 2011.

|                        |  |          |          |          |          |
|------------------------|--|----------|----------|----------|----------|
| <b>B19PS6062</b>       | <b>Design and Analysis of Algorithms</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14Wks</b> |  | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**Prerequisites:**

Discrete Mathematics - sets, functions, relations; proofs, and proofs by induction, Boolean logic, Basic probability.

**Course Objectives:**

The objectives of this course are to:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.

**Course Outcomes:**

After the completion of the course the student will be able

4. Ability to Understand, Analyze the performance of recursive and non-recursive algorithms and use of asymptotic notations to measure the performance of algorithms.
5. Identify and analyze various algorithm design techniques
6. Understand and evaluate algorithms using various algorithm design techniques
7. Ability to understand the limitations of Algorithm power and identify algorithm design Techniques to cope up with the limitations.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code      | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS6062</b> | CO1     | 3   | 3   | 2   | 3   | 2   | 1   | 1   | 2   | 2    | 2    |
|                  | CO2     | 3   | 2   | 2   | 2   | 2   | 1   | 1   | 1   | 2    | 2    |
|                  | CO3     | 3   | 3   | 2   | 2   | 2   | 1   | 1   | 2   | 2    | 2    |

|  |     |   |   |   |   |   |   |   |   |   |   |
|--|-----|---|---|---|---|---|---|---|---|---|---|
|  | CO4 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 2 | 2 |
|--|-----|---|---|---|---|---|---|---|---|---|---|

**Course Contents:****UNIT – I****6 Hrs**

Introduction: Performance Analysis - Space complexity and Time complexity (posteriori testing, and a priori approach), Asymptotic Notations ( $O$ ,  $\Omega$ ,  $\Theta$ ). Average, Best and Worst case complexity.

**UNIT – II****6 Hrs**

Introduction to Divide and Conquer Algorithms - Finding the Maximum and Minimum, Quick sort (Derivation of Average case analysis and Worst case analysis), Binary Search (Derivation of Average case analysis).

**UNIT – III****6 Hrs**

Introduction to Greedy Algorithms – Knapsack Problem and Fractional Knapsack problem, minimum costspanning trees, Kruskal's Algorithm and Prim's Algorithm, Single-Source Shortest Paths.

**UNIT – IV****6 Hrs**

Dynamic Programming: Definition - All-pairs shortest paths, Travelling salesman problem, Multistage graphs. Back Tracking - N-Queens, Sum of Subsets, Graph colouring.

## Text Books:

1. Horowitz, Sahni, Rajasekaran, Fundamentals of Computer Algorithms, Universities Press Pvt Ltd.

## Reference Books:

1. Design & Analysis of Algorithms-Horowitz & Sahni
2. GAV PAI, Data structures and Algorithms, Tata McGraw Hill.

|                         |                              |          |          |          |          |
|-------------------------|------------------------------|----------|----------|----------|----------|
| <b>B19PS6063</b>        | <b>Computer Architecture</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration: 14 Wks</b> |                              | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**Prerequisites:**

Combinational circuits and assembler programming, Memory hierarchy and memory caches

**Course Objectives:**

The objectives of this course are to:

1. Discuss the basic concepts and structure of computers.
2. Understand concepts of register transfer logic and arithmetic operations.
3. Explain different types of addressing modes and memory organization.
4. Learn the different types of serial communication techniques.
5. Summarize the Instruction execution stages.

**Course Outcomes:**

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

6. Understand the functional units of the processor such as the register file and arithmetic-logical unit, and with the basics of systems topics.
7. Interpret the design trade-offs in designing and constructing a computer processor.
8. Implement the basic knowledge of I/O devices and interfacing of I/O devices with computer.
9. Understand the Direct Memory Access Transfer and CPU-IOP communication

### Mapping of Course Outcomes with programme Outcomes

| Course Code      | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS6063</b> | CO1     | 3   | 3   | 2   | 3   | 2   | 1   | 1   | 2   | 2    | 2    |
|                  | CO2     | 3   | 2   | 2   | 2   | 2   | 1   | 1   | 1   | 2    | 2    |
|                  | CO3     | 3   | 3   | 2   | 2   | 2   |     |     | 2   | 2    | 2    |
|                  | CO4     | 3   | 3   | 3   | 3   | 2   |     |     | 2   | 2    | 2    |

#### Course Contents:

#### UNIT – I

6 Hrs

Basic Computer Organization and Design: Instruction codes, computer instruction, timing and control, execution and instruction, input-output and interrupt, design of computer.

#### UNIT – II

6 Hrs

Central Processor Organization: Processor bus organization, arithmetic logic UNIT (ALU) instruction formats, addressing modes, data transfer and manipulation, program control, microprocessor organization.

#### UNIT – III

6 Hrs

Input-Output Organization: Peripheral devices. asynchronous data transfer, direct memory access (DMA), priority interrupt, input –output processor (IOP).

#### UNIT – IV

6 Hrs

Memory organization: Auxiliary memory, microcomputer memory hierarchy, associative memory, virtual memory, cache memory.

#### Text Books:

1. M.Moris Mano, Computer System, Architecture, 2nd Edition Prentice Hall of India.

#### Reference Books:

1. William Stallings, Computer Organization and Architecture, Pearson Education
2. Andrew S. Tenenbaum, Structured Computer Organization, 3rd Edition; Prentice Hall of India

|                         |                                   |          |          |          |          |
|-------------------------|-----------------------------------|----------|----------|----------|----------|
| <b>B19PS6070</b>        | <b>MOOC / SWAYAM / Internship</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14 Wks</b> |                                   | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**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.

|                         |                   |          |          |          |          |
|-------------------------|-------------------|----------|----------|----------|----------|
| <b>B19PS6080</b>        | <b>Soft Skill</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14 Wks</b> |                   | <b>1</b> | <b>1</b> | <b>0</b> | <b>2</b> |

**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.

|                         |                          |          |          |          |          |
|-------------------------|--------------------------|----------|----------|----------|----------|
| <b>B19PS6090</b>        | <b>Physics Lab – VII</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14 Wks</b> |                          | <b>0</b> | <b>0</b> | <b>1</b> | <b>3</b> |

**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.

|                         |
|-------------------------|
| <b>Course Outcomes:</b> |
|-------------------------|

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/<br>COs | PO1      | PO2      | PO3      | PO4      | PO5      | PO6 | PO7 | PO8 | PSO1     | PSO2     |
|------------------|-------------|----------|----------|----------|----------|----------|-----|-----|-----|----------|----------|
| <b>B19PS6090</b> | <b>CO1</b>  | <b>3</b> | <b>2</b> | <b>2</b> |          | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO2</b>  | <b>3</b> | <b>2</b> | <b>2</b> | <b>1</b> | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO3</b>  | <b>2</b> | <b>2</b> | <b>2</b> | <b>1</b> | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO3</b>  | <b>2</b> | <b>2</b> | <b>2</b> | <b>1</b> | <b>1</b> |     |     |     | <b>2</b> | <b>2</b> |

|                         |
|-------------------------|
| <b>Course Contents:</b> |
|-------------------------|

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:**

11. Thiruvadigal, J. D., Ponnusamy, S.Sudha.D. and Krishnamohan M., “Physics for Technologists”, Vibrant Publication, Chennai, 2013
12. 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).

17.

|                         |                            |          |          |          |          |
|-------------------------|----------------------------|----------|----------|----------|----------|
| <b>B19PS6X10</b>        | <b>Mathematics Lab - V</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration :14 Wks</b> |                            | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**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/       | PO1      | PO2      | PO3      | PO4      | PO5      | PO6 | PO7 | PO8 | PSO1     | PSO2     |
|------------------|------------|----------|----------|----------|----------|----------|-----|-----|-----|----------|----------|
|                  | <b>COs</b> |          |          |          |          |          |     |     |     |          |          |
| <b>B19PS6X10</b> | <b>CO1</b> | <b>3</b> | <b>2</b> | <b>2</b> |          | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO2</b> | <b>3</b> | <b>2</b> | <b>2</b> | <b>1</b> | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO3</b> | <b>2</b> | <b>2</b> | <b>2</b> | <b>1</b> | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |
|                  | <b>CO4</b> | <b>3</b> | <b>2</b> | <b>2</b> |          | <b>1</b> |     |     |     | <b>3</b> | <b>3</b> |

**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 laplacian 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.

|                 |                         |   |   |   |   |
|-----------------|-------------------------|---|---|---|---|
| B19PS6X20       | Numerical Methods – Lab | L | T | P | C |
| Duration:14 Wks |                         | 0 | 0 | 2 | 2 |

**Prerequisites:**

Basic concepts of numerical methods

**Course Objectives:**

- To provide students with an introduction to the field of numerical analysis.
- 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;
- 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:**

- Acquire proficiency in using MAXIMA to study Numerical Analysis.
- Use MAXIMA to solve the system of equations
- Be familiar with the built-in functions to find largest eigen value using power method.
- 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 4<sup>th</sup> 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.

|                        |                                 |          |          |          |          |
|------------------------|---------------------------------|----------|----------|----------|----------|
| B19PS6X40              | <b>Computer Science Project</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Duration:14 Wks</b> |                                 | <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**Prerequisites:**

Basic Knowledge of the programming concepts studied in previous semesters.

**Course Objectives:**

1. **Knowledge Application:** Students will acquire the ability to make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
2. **Communication:** Students will acquire the skills to communicate effectively and to present ideas clearly and coherently to a specific audience in both the written and oral forms.
3. **Collaboration:** Students will acquire collaborative skills through working in a team to achieve common goals.
4. **Independent Learning:** Students will be able to learn on their own, reflect on their learning and take appropriate action to improve it.
5. **Management and Finance:** Students will prepare schedules and budgets, they along with the guide keep track of the progress and expenditure.

**Course Outcomes:**

1. Perform literature review, identify state of the art in that field and be able define the problem.
2. Establish a methodology using advanced tools / techniques for solving the problem including project management and finances.
3. Design, Develop Analytical models, Perform Numerical Analysis and interpret the results.
4. Prepare quality document of project work for publications, patenting and final thesis.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code      | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 |
|------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>B19PS6X40</b> | CO1     | 3   | 1   | 1   | 3   | 2   | 1   | 1   | 2   | 3    | 3    |
|                  | CO2     | 3   | 1   | 1   | 2   | 2   | 1   | 1   | 1   | 3    | 3    |
|                  | CO3     | 2   | 1   | 1   | 2   | 2   | 3   | 3   | 2   | 3    | 3    |
|                  | CO4     | 2   | 1   | 1   | 3   | 2   | 2   | 3   | 2   | 3    | 3    |

## **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.

**LIST OF FACULTY MEMBERS**

| <b>Sl. No</b> | <b>Name of the Teacher</b> | <b>Designation</b>                    | <b>Contact No.</b> | <b>E-mail</b>             |
|---------------|----------------------------|---------------------------------------|--------------------|---------------------------|
| 1             | Dr. D. V. Sunitha          | Associate Professor<br>& Co-ordinator | 7760884884         | sunithadv@reva.edu.in     |
| 2             | Mrs. Bharathi Devi         | Associate Professor                   | 9886199024         | bharathidevi@reva.edu.in  |
| 3             | Dr. Madesh Kumar           | Associate Professor                   | 9341271290         | madeshkumar@reva.edu.in   |
| 4             | Dr. Jayadev Pattar         | Associate Professor                   | 9620305750         | jayadevpattar@reva.edu.in |
| 5             | Dr.P.Anjaneyulu            | Associate Professor                   | 9741965325         | p.njaneyulu@reva.edu.in   |
| 6             | Mrs.Usha.S K               | Assistant Prof.                       | 9481033638         | ushask@reva.edu.in        |
| 7             | Dr. Prakash Babu           | Assistant Professor                   | 9916322600         | prakashbabu.d@reva.edu.in |
| 8             | Prof. G Ranjith<br>Kumar   | Assistant Professor                   | 9449441201         | Ranjith.k@reva.edu.in     |
| 9             | Dr. K Munirathnam          | Assistant Professor                   | 9164040013         | kmunirathnam@reva.edu.in  |
| 10            | Mr.Deepak.K                | Assistant Professor                   | 8892926677         | deepak@reva.edu.in        |
| 11            | Dr.Hareesh K               | Assistant Professor                   | 9986996834         | hareesh.k@reva.edu.in     |