



**SCHOOL OF APPLIED SCIENCES**  
**B. Sc., (Mathematics, Statistics, Computer science)**  
**HANDBOOK**

**2019-22**

Rukmini Knowledge Park,  
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**Rukmini Educational**  
Charitable Trust

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

## Chancellor's Message

*“Education is the most powerful weapon which you can use to change the world.”*

- Nelson Mandela.

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



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

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

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

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

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

## Vice-Chancellor's Message

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

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

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

At REVA University, research, consultancy and innovation are regarded as our pillars of success. Most of the faculty members of the University are involved in research by attracting funded projects from various



research level organizations like DST, VGST, DBT, DRDO, AICTE and industries. The outcome of the research is passed on to students through live projects from industries. The entrepreneurial zeal of the students is encouraged and nurtured through EDPs and EACs.

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

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

Welcome to the portals of REVA University!

**Dr. S. Y. Kulkarni**

Vice-Chancellor, REVA University

## Director's – message

Higher education across the globe is opening doors of its academic disciplines to the real-world experiences. The disciplinary legitimacy is under critical review. Trans-border mobility and practice learning are being fore-grounded as guiding principles. Interactive learning, bridging disciplines and facilitating learners to gain different competencies through judicious management of time is viewed as one of the greatest and fascinating priorities and challenges today.



Indian economy is experiencing an upward growth right from the beginning of 21st century necessitating well qualified science graduates to work as scientists, teachers, algorithm developers, computer programmers, professionals and often administrators. At present more than 400 million youth are below 18 years of age and government is committed to increase the GER to 30% by 2020, further necessitating more number of teachers and professors to work in schools and colleges. Research has also been given equal importance. Private sector and Corporates are also looking for smart science graduates in a big way. The B.Sc. (M St Cs) degree program of REVA University is designed to prepare Mathematicians, Statisticians, software developers, 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 curriculum caters to and has relevance to local regional, national and global developmental needs. Maximum number of courses are integrated with crosscutting issues with relevant to professional ethics, Gender, Human values, Environment and sustainability.

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. The curriculum caters to and has relevance to local regional, national and global developmental needs. Maximum number of courses are integrated with crosscutting issues with relevant to professional ethics, Gender, Human values, Environment and sustainability.

This handy document containing brief information about B.Sc. (M St Cs) program, scheme of instruction and detailed course content will serve as a guiding path to you to move forward in a right direction.

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

**Dr. Beena G**

Director  
School of Applied Sciences

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## **RUKMINI EDUCATIONAL CHARITABLE TRUST**

It was the dream of late Smt. Rukmini Shyama Raju to impart education to millions of underprivileged children as she knew the importance of education in the contemporary society. The dream of Smt. Rukmini Shyama Raju came true with the establishment of Rukmini Educational Charitable Trust (RECT), in the year 2002.

**Rukmini Educational Charitable Trust** (RECT) is a Public Charitable Trust, set up in 2002 with the objective of promoting, establishing and conducting academic activities in the fields of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology, among others. In furtherance of these objectives, the Trust has set up the REVA Group of Educational Institutions comprising of REVA Institute of Technology & Management (RITM), REVA Institute of Science and Management (RISM), REVA Institute of Management Studies (RIMS), REVA Institute of Education (RIE), REVA First Grade College (RFGC), REVA Independent PU College at Kattigenahalli, Ganganagar and Sanjaynagar and now REVA University. Through these institutions, the Trust seeks to fulfill its vision of providing world class education and create abundant opportunities for the youth of this nation to excel in the areas of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology.

Every great human enterprise is powered by the vision of one or more extraordinary individuals and is sustained by the people who derive their motivation from the founders. The Chairman of the Trust is Dr. P. Shyama Raju, a developer and builder of repute, a captain of the industry in his own right and the Chairman and Managing Director of the DivyaSree Group of companies. The idea of creating these top notched educational institutions was born of the philanthropic instincts of Dr. P. Shyama Raju to do public good, quite in keeping with his support to other socially relevant charities such as maintaining the Richmond road park, building and donating a police station, gifting assets to organizations providing accident and trauma care, to name a few.

The Rukmini Educational Charitable Trust drives with the main aim to help students who are in pursuit of quality education for life. REVA is today a family of ten institutions providing education from PU to Post Graduation and Research leading to PhD degrees. REVA has well qualified experienced teaching faculty of whom majority are doctorates. The faculty is supported by committed administrative and technical staff. Over 11,000 students study various courses across REVA's three campuses equipped with exemplary state-of-the-art infrastructure and conducive environment for the knowledge driven community.



## **ABOUT REVA UNIVERSITY**

REVA University has been established under the REVA University Act, 2012 of Government of Karnataka and notified in Karnataka State Gazette dated 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 18 disciplines. It has 800+ well qualified, experienced and committed faculty members of whom majority are doctorates in their respective areas and most of them are guiding students pursuing research leading to PhD.

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

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

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

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

The University has collaborations with Industries, universities abroad, research institutions, corporate training organizations, and Government agencies such as Florida International University, 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 Vidaaya, - Graduation Day for the final year students of all the programs, wherein, the outgoing students are felicitated and are addressed by eminent personalities to take their future career in a right spirit, to be the good citizens and dedicate themselves to serve the society and make a mark in their respective spheres of activities. During this occasion, the students who have achieved top ranks and won medals and prizes in academic, cultural and sports activities are also recognized by distributing awards and prizes. The founders have also instituted medals and prizes for sports achievers every year. The physical education department conducts regular yoga classes everyday to students, faculty members, administrative staff and their family members and organizes yoga camps for villagers around.

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

### **Vision**

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

### **Mission**

- To create excellent infrastructure facilities and state-of-the-art laboratories and incubation centers
- To provide student-centric learning environment through innovative pedagogy and education reforms
- To encourage research and entrepreneurship through collaborations and extension activities
- To promote industry-institute partnerships and share knowledge for innovation and development
- To organize society development programs for knowledge enhancement in thrust areas
- To enhance leadership qualities among the youth and enrich personality traits, promote patriotism and moral values.

## Objectives

- Creation, preservation and dissemination of knowledge and attainment of excellence in different disciplines
- Smooth transition from teacher - centric focus to learner - centric processes and activities
- Performing all the functions of interest to its major constituents like faculty, staff, students and the society to reach leadership position
- Developing a sense of ethics in the University and Community, making it conscious of its obligations to the society and the nation
- Accepting the challenges of globalization to offer high quality education and other services in a competitive manner

## **ABOUT SCHOOL OF APPLIED SCIENCES**

The School of Applied Sciences offers graduate and post graduate programs in Biotechnology, Biochemistry, Chemistry, Physics and Mathematics which are incredibly fascinating. It aims to attract talented youth and train them to acquire knowledge and skills useful to industrial sectors, research laboratories, and educational institutions. The School presently offers B.Sc. degree programs in Bio-Chemistry, Bio-Technology, Chemistry, Physics, Mathematics and B Sc with various combinations viz, Biotechnology, Biochemistry and Genetics, Physics Chemistry and Mathematics, 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

## Board of Studies for B.Sc., in Mathematics, Statistics, Computer Science

Date of Meeting: 30<sup>th</sup> May 2018

Time: 10.30 AM

Sl.No.	Name of the Member	Designation
1	<b>Dr. Harish Babu G A</b> Professor and Coordinator Department of Mathematics, REVA University <a href="mailto:harishbabuga@reva.edu.in">harishbabuga@reva.edu.in</a> ; 9845549977	<b>Chairman</b>
2	<b>Dr. Vishu Kumar M</b> Professor Department of Mathematics, REVA University <a href="mailto:vishukumarm@reva.edu.in">vishukumarm@reva.edu.in</a> ; 9845871372	<b>Mathematics – Internal Member</b>
3	<b>Dr. Hanumagowda B N</b> Professor Department of Mathematics REVA University <a href="mailto:hanumagowdabn@reva.edu.in">hanumagowdabn@reva.edu.in</a> 9845871372	<b>Mathematics – Internal Member</b>
4	<b>Dr. Uday Kumar K M</b> Associate Professor, School of Physical Science - Department of Mathematics REVA University <a href="mailto:udayakumarkn@reva.edu.in">udayakumarkn@reva.edu.in</a> 9980923283	<b>Mathematics – Internal Member</b>
5	<b>Prof. Brinda Halmadi</b> Assistant Professor, Department of Mathematics REVA University <a href="mailto:brinda@revainstitution.org">brinda@revainstitution.org</a> ; 9844659900	<b>Mathematics – Internal Member</b>
6	<b>Major. K Shivakumar</b> Associate Professor, GFGC Yelahanka <a href="mailto:Shiva1962@gmail.com">Shiva1962@gmail.com</a> ; 9448809881	<b>Mathematics – External Member</b>
7	<b>Ms. Mohankumari C</b> Assistant Professor, Department of Statistics, REVA University <a href="mailto:mohankumaric@revainstitution.org">mohankumaric@revainstitution.org</a> 9741403154	<b>Statistics – Internal Member</b>
8	<b>Mr. Narayana Gowda N</b> Assistant Professor, Department of Statistics, REVA University, <a href="mailto:mohankumaric@revainstitution.org">mohankumaric@revainstitution.org</a> <a href="mailto:kngowda@gmail.com">kngowda@gmail.com</a> ; 9844011027	<b>Statistics – Internal Member</b>
9	<b>Mr. Shantappanavar S B</b> Assistant Professor, Department of Statistics, Maharani Science College, Mysore. <a href="mailto:shantappanavar@gmail.com">shantappanavar@gmail.com</a> ; 9448294319	<b>Statistics – External Member</b>
10	<b>Mr. Prasanna Kumar R B</b> Assistant Professor, School of Computer Science and Applications, REVA University <a href="mailto:prasannakumarrb@reva.edu.in">prasannakumarrb@reva.edu.in</a> ; 9342203018	<b>Computer Science – Internal Member</b>
11	<b>Mr. Kiran Kumar A N</b> Senior Member Technical Staff, Oracle India Pvt Ltd, Thavarekere, Bangalore. <a href="mailto:kiran.f.kumar@oracle.com">kiran.f.kumar@oracle.com</a> ; 9945508652	<b>Computer Science – External Member</b>

## **B.Sc.(Mathematics,Statistics, Computer Science) Program**

### **Programme Overview**

The mathematical sciences are a group of areas of study that includes, in addition to mathematics, those academic disciplines that are primarily mathematical in nature but may not be universally considered subfields of mathematics proper. Statistics, for example, is mathematical in its methods but grew out of scientific observations which merged with inverse probability and grew through applications in the social sciences. Computer science, computational science, population genetics, operations research, cryptology, econometrics, theoretical physics, chemical reaction, network theory and actuarial science have basis of mathematical science.

Mathematical sciences work is becoming an increasingly integral and essential component of a growing array of areas of investigation in biology, medicine, social sciences, business, advanced design, climate, finance, advanced materials, and much more. This work involves the integration of mathematics, statistics, and computation in the broadest sense, and the interplay of these areas with areas of potential application; the mathematical sciences are best conceived of as including all these components. These activities are crucial to economic growth, national competitiveness, and national security.

REVA UNIVERSITY has designed to offer B.Sc. in Mathematics, Statistics and Computer Science degree programme to prepare motivated, enthusiastic, and creative thinking graduates to fill the roles as mathematicians, statisticians, algorithm developers, computer programmers, teachers, 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, scientists, algorithm developers, computer programmers professionals and often administrators. At present more than 400 million youth are below 18 years of age and government is committed to increase the GER to 30% by 2020, further necessitating more number of teachers and professors to work in schools and colleges. This B.Sc. (M St Cs) degree program is designed to prepare mathematicians, statisticians, algorithm developers, computer programmers, scientists, teachers, professionals and administrators to meet the challenges of growing economy as well as to meet the growing aspirations of the youth.

The B.Sc. (M St Cs) programme has been planned and designed after a detailed study and interactions with various universities, research establishments and industries in India and abroad. The program has been developed with an emphasis on knowledge assimilation, application, national job market and its social relevance. The



curriculum is outcome based and it imbibes required theoretical concepts and practical skills in the domain. By undergoing this programme, students develop critical, 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. (M St Cs) programme of REVA University is to prepare graduates to

PEO-1	Demonstrate problem solving skills in mathematics, statistics 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 life long learning skills.

### **Program Outcomes (POs)**

- 1. Science knowledge:** Demonstrate the knowledge in the areas of mathematics, statistics and computer science.
- 2. Problem analysis:** Apply the fundamentals of mathematics, statistics and computer science to formulate, solve and interpret complex problems.
- 3. Design/development of solutions:** Comprehend, analyze, model and solve complex problems in the areas of mathematics, statistics and computer science.
- 4. Life-long learning:** Recognize the need to expertise in the areas of mathematics, statistics and computer science by self up gradation through life long learning.
- 5. Communication:** Communicate with clarity and coherence, both written and verbally.
- 6. Ethics:** Exhibit professional and ethical responsibility.

**7. Individual and team work:** Encourage collaborative learning through group activities and hands-on learning.

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

### **Programme Specific Outcomes (PSO)**

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

1. Acquire a strong conceptual foundation in the area of mathematics, statistics and computer science using latest software tools and technologies, along with analytical and managerial skills to arrive at cost effective and optimum solutions.
2. Implant the capacity to apply theoretical concepts to design and develop solutions.

Attainment of CO (Course Outcome)

CO Attainment	Value
0.4 - 0.6	1
0.6 – 0.75	2
> 0.75	3

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2
<b>B19SM1011</b>	CO1					2	3				
	CO2					2	3				
	CO3						3	3	2		
	CO4							3	2		
<b>B19SM1012</b>	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			
<b>B19SM1013</b>	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		
<b>B19SM1020</b>	CO1					3	3	3	1		
	CO2					3	3	3	2		
	CO3					3	3	3	2		
	CO4					3	3	3	1		
<b>B19SM1030</b>	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>B19SM1040</b>	CO1	2	3	2	2	1	2	1	1	3	2
	CO2	2	3	2	3	1	2	1	1	2	3
	CO3	3	3	2	3	1	2	1	1	2	2
	CO4	2	2	2	3	2	2	1	1	2	2
<b>B19SM1050</b>	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>B19SM1060</b>	CO1										
	CO2										
	CO3										

	<b>CO4</b>										
<b>B19SM1070</b>	<b>CO1</b>	3	2	2		1				3	3
	<b>CO2</b>	3	2	2		1				3	3
	<b>CO3</b>	2	2	2		1				2	3
	<b>CO4</b>	3	2	2		1				3	2
<b>B19SM1080</b>	<b>CO1</b>	2	3	2	2	1	2	1	1	3	2
	<b>CO2</b>	2	3	2	3	1	2	1	1	2	3
	<b>CO3</b>	3	3	2	3	1	2	1	1	2	2
	<b>CO4</b>	2	2	2	3	2	2	1	1	2	2
<b>B19SM1090</b>	<b>CO1</b>	3	3	3	3			2	3	3	2
	<b>CO2</b>	3	3	3	3			2	3	3	3
	<b>CO3</b>	3	3	3	2			2	3	3	3
	<b>CO4</b>	3	3	3	2				1	3	2
<b>B19SM2011</b>	<b>CO1</b>					2	3				
	<b>CO2</b>					2	3				
	<b>CO3</b>						3				
	<b>CO4</b>							3	2		
<b>B19SM2012</b>	<b>CO1</b>					2	3	2			
	<b>CO2</b>					2	2	3			
	<b>CO3</b>					3	3	3			
	<b>CO4</b>					3	2	3			
<b>B19SM2013</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		
<b>B19SM2020</b>	<b>CO1</b>					3	3	3	1		
	<b>CO2</b>					3	3	3	2		
	<b>CO3</b>					3	3	3	1		
	<b>CO4</b>					3	3	3	1		
<b>B19SM2030</b>	<b>CO1</b>	3	2	2				1	1	3	2
	<b>CO2</b>	2	2	2				1	1	3	3
	<b>CO3</b>	3	2	2				1	1	3	3
	<b>CO4</b>	3	2	2				1	1	3	2
<b>B19SM2040</b>	<b>CO1</b>	2	3	2	3	1	2	1	1	3	2
	<b>CO2</b>	2	2	1	1	1	1	1	1	2	1
	<b>CO3</b>	3	3	2	3	1	2	1	1	3	3
	<b>CO4</b>	2	3	2	2	1	2	1	1	3	3
<b>B19SM2050</b>	<b>CO1</b>	3	3	3	3	2		2	3	3	3
	<b>CO2</b>	3	3	3	2				3	3	3
	<b>CO3</b>	3	3	3	3	2		2	3	3	2
	<b>CO4</b>	3	3	3	2			2	2	3	2
<b>B19SM2060</b>	<b>CO1</b>	1	2	1	1	1	2	3	1	1	1
	<b>CO2</b>	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>B19SM2080</b>	CO1	3	2	2				1	1	3	3
	CO2	3	2	2	1			1	1	3	3
	CO3	2	2	2	1			1	1	3	3
	CO4	3	2	2				1	1	3	3
<b>B19SM2090</b>	CO1	2	3	2	3	1	2	1	1	3	2
	CO2	2	2	1	1	1	1	1	1	2	1
	CO3	3	3	2	3	1	2	1	1	3	3
	CO4	2	3	2	2	1	2	1	1	3	3
<b>B19SM2X10</b>	CO1	3	3	3	3			2	3	3	3
	CO2	3	3	3	2				3	3	3
	CO3	3	3	3	3			2	3	3	2
	CO4	3	3	3	3					3	2
<b>B19SM3011</b>	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		
<b>B19SM3012</b>	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			
<b>B19SM3013</b>	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		
<b>B19SM3020</b>	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		
<b>B19SM3030</b>	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>B19SM3040</b>	CO1	2	2	2	2	1	1	1	1	2	2
	CO2	2	3	3	3	1	2	1	1	3	3
	CO3	2	2	1	2	1	1	1	1	2	2
	CO4	2	3	3	2	1	2	1	1	3	2
<b>B19SM3050</b>	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>B19SM3060</b>	CO1	3	2	2	2			1	1	2	3

	CO2	3	2	2	2			1	1	3	2
	CO3	3	2	2	2			1	1	3	3
	CO4	3	3	2	2			1	1	2	3
B19SM3070	CO1	3	2	2	1			1	1	3	2
	CO2	3	2	2	1			1	1	3	3
	CO3	3	2	2	1			1	1	3	2
	CO4	3	2	2	1			1	1	2	3
B19SM3080	CO1	2	2	2	2	1	1	1	1	2	2
	CO2	2	3	3	3	1	2	1	1	3	3
	CO3	2	2	1	2	1	1	1	1	2	2
	CO4	2	3	3	2	1	2	1	1	3	2
B19SM3090	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
B19SM4011	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		
B19SM4012	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			
B19SM4013	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		
B19SM4020	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		
B19SM4030	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
B19SM4040	CO1	2	3	2	2	1	2	1	1	3	2
	CO2	2	2	2	2	1	2	1	1	2	2
	CO3	2	2	1	1	1	1	1	1	2	2
	CO4	2	3	2	2	1	2	1	1	2	2
B19SM4050	CO1	3	3	3				1	2	3	3
	CO2	3	3	2	2				2	3	1
	CO3	3	2	2	1			1	1	3	2
	CO4	3	2	2	2			2	2	3	2

<b>B19SM4070</b>	CO1	3	2	2	1			1	1	3	2
	CO2	3	2	2	1			1	1	3	3
	CO3	3	2	2	1			1	1	3	2
	CO4	3	2	2	1			1	1	2	2
<b>B19SM4080</b>	CO1	2	3	2	2	1	2	1	1	3	2
	CO2	2	2	2	2	1	2	1	1	2	2
	CO3	2	2	1	1	1	1	1	1	2	2
	CO4	2	3	2	2	1	2	1	1	2	2
<b>B19SM4090</b>	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
<b>B19SM5010</b>	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>B19SM5020</b>	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>B19SM5030</b>	CO1	2	3	3	3	2	2	2	1	3	3
	CO2	2	3	2	3	1	2	2	1	3	2
	CO3	2	3	2	3	1	2	1	1	3	3
	CO4	2	3	2	3	1	2	1	1	2	3
<b>B19SM5040</b>	CO1	2	3	3	2			2	1	3	
	CO2	3	3	2	3			2	3	3	2
	CO3	2	3	2	3			1	3		3
	CO4	2	3	2	3			1	3	1	3
<b>B19SM5050</b>	CO1	3	2	3	2	3	1		2	3	3
	CO2	2	1	3	1			2	3	3	2
	CO3	2	1	3		1		3	1	2	3
	CO4	2	2	3	3	3	1	1		3	1
<b>B19SM5061</b>	CO1	3	2	2	2					3	1
	CO2	3	3	2	2					3	2
	CO3	3	3	2	2					3	1
	CO4	3	3	2	2					3	1
<b>B19SM5062</b>	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
<b>B19SM5063</b>	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
B19SM5071	CO1	2	3	3	2			1		3	
	CO2	3	3	2	3			1	2	3	1
	CO3	2	3	2	3			1	2	3	2
	CO4	2	3	2	3			1	2		3
B19SM5072	CO1	2	3	3	2			1	2	3	
	CO2	3	3	2	3			1	2	3	1
	CO3	2	3	2	3			1	2	3	3
	CO4	2	3	2	3			1	2	2	3
B19SM5073	CO1	3	3	3	2			1	2	3	
	CO2	3	2	2	3			1	3	3	2
	CO3	2	3	3	3			1	3	2	3
	CO4	2	3	2	3			1	3	2	3
B19SM5081	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
B19SM5082	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
B19SM5083	CO1	2	1	3	2	2	3		3	2	3
	CO2	2	1	2	3	3	2			3	2
	CO3	1	1	2	3	1		2	3	3	2
	CO4	1	1	2	2	3		3		2	2
B19SM5X10	CO1	2	3	3	3	2	2	2	1	3	3
	CO2	2	3	2	3	1	2	2	1	3	2
	CO3	2	3	2	3	1	2	1	1	3	3
	CO4	2	3	2	3	1	2	1	1	2	3
B19SM5X20	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
	CO4	3	2	3	3	1	1	3	2	3	1
B19SM5X30	CO1	3	2	2	2	2	1	1	1	2	2
	CO2	3	3	2	2	3	1	1	1	2	3
	CO3	3	3	3	3	3	1	1	2	3	3
	CO4	1	3	2	3	2	2	2	3	2	3
B19SM5X30	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	3	1	2	2	2	3	3	2	1
B19M5X30	CO1	1	1	2	3	2	1	2	1	2	1
	CO2	2	2	2	3	2	2	2	2	2	3



	CO3	1	2	1	3	3	3	1	1	1	2
	CO4	2	3	2	2	1	2	3	3	2	3
B19SM6010	CO1	3	3	2	3					3	2
	CO2	3	3	3	3					3	3
	CO3	3	2	3	2					3	2
	CO4	3	2	3	3					3	3
B19SM6020	CO1	3	3	3	2			1	2	3	
	CO2	3	2	2	3			1	2	2	2
	CO3	2	3	3	3			1	3	1	3
	CO4	3	3	2	3			1	3	2	3
B19SM6030	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
B19SM6041	CO1	3	3	2	3					2	3
	CO2	3	3	2	2					3	3
	CO3	3	2	3	3					3	2
	CO4	3	3	3	2					3	3
B19SM6042	CO1	3	3	2	2	2				3	3
	CO2	3	2	3	2	3				2	3
	CO3	3	3	2	3	2				3	3
	CO4	3	3	2	3	2				3	2
B19SM6043	CO1	3	3	2	2	3				3	3
	CO2	3	2	3	2	2				2	3
	CO3	3	3	2	3	3				3	2
	CO4	3	3	3	2	2				3	3
B19SM6051	CO1	3	3	3	2			1	1	2	3
	CO2	3	2	2	3			1	3	2	2
	CO3	2	3	3	3			1	3	3	3
	CO4	3	3	2	3			1	3	3	3
B19SM6052	CO1	3	3	3	2			1	1	2	0
	CO2	3	2	2	3			1	3	2	2
	CO3	2	3	3	3			1	3	3	3
	CO4	3	3	2	3			1	3	3	3
B19SM6053	CO1	3	3	3	3			1	1	3	
	CO2	3	2	2	3			1	3	3	1
	CO3	2	3	3	3			1	3	1	3
	CO4	3	3	2	3			1	3	2	3
B19SM6061	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
B19SM6062	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
B19SM6063	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
B19SM6090	CO1	3	2	2	2					3	3
	CO2	3	2	3	2					2	2
	CO3	3	3	2	3					3	3
	CO4	3	2	2	2					3	3
B19SM6X10	CO1	3	3	2	2					2	3
	CO2	3	2	2	3					3	2
	CO3	3	2	3	2					3	2
	CO4	3	3	2	2					3	3
B19SM6X20	CO1	3	3	3	2	1		1	1	2	3
	CO2	3	2	2	3	1		1	3	1	2
	CO3	2	3	3	3	1		1	3	3	3
	CO4	3	3	2	3	1		1	3	3	3
B19SM6X30	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

Note: 3=H=High, 2=M=Medium and 1=L=Low

#### Mapping of PEOs with Respect to POs

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

# **REVA University Regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for Under Graduate 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 Post Graduate Degree Programs-2019**”.

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

## **2. The Programs:**

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

### **B.Sc in:**

Biotechnology, Biochemistry and Genetics  
Physics Chemistry and Mathematics  
Mathematics, Physics and Statistics  
Mathematics Statistics and Computer Science  
Bioinformatics, Biology Mathematics & Computer Science  
Medical Laboratory Technology

## **3. Definitions:**

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

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

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

**T** stands for **Tutorial** session consisting participatory discussion / selfstudy/ desk work/ brief seminar presentations by students and such other novel methods that make a student to absorb and assimilate more effectively the contents delivered in the Lecture classes.

**P** stands for **Practice** session and it consists of Hands on Experience / Laboratory Experiments / Field Studies / Case Studies that equip students to acquire the much required skill component.

## **4. Courses of study and Credits**

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

4.1.1. In terms of credits, every **one hour session of L amounts to 1 credit per Semester.**

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

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

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

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

**4.1.5. Different Courses of Study** are labelled and defined as follows:

**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)**

Foundation Courses are four courses including language study which are mandatory in nature prescribed by the University and should be completed successfully as part of Graduate Degree Program irrespective of the branch of study.

**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**.

**f. Project Work / Dissertation:**

Project work / Dissertation work is a special course involving application of knowledge in solving / analysing /exploring a real life situation / difficult problem. A project work carrying **FOUR or SIX** credits is called **Minor Project work / Dissertation**. A project work of **EIGHT, TEN, TWELVE or SIXTEEN** credits is called **Major Project work / Dissertation**. **A Project work may be a hard core or a Soft Core as decided by the BoS / concerned.**

**5. Eligibility for Admission:**

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

**6. Scheme, Duration and Medium of Instructions:**

**6.1**The Three Year degree program is of 6 semester (3 years) duration. A candidate can avail a maximum of 12 semesters (6 years) as per double duration norm, in one stretch to complete the ThreeYear Degree, including blank semesters, if any. Whenever a candidate opts 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 144 credits for successful completion of Three Year Degree with a distribution of credits for different courses as given in Table - 1 given below:

**Table-1**  
**Credits and Credit Distribution for ThreeYear degree programs**

<b>Course Type</b>	<b>Credits for Three Year Degree (6 semesters)</b>
Hard Core Course	A minimum of 76 but not exceeding 100
Soft Core Course	A minimum of 12 but not exceeding 24
Foundation Course	A minimum of 04 but not exceeding 16
Core Course (languages)	A minimum of 14 but not exceeding 24
Open Elective Course	A minimum of 04
RULO	A minimum of 2 but not exceeding 12
<b>Total</b>	<b>144</b>

**7.2.** The concerned BOS based on the credits distribution pattern given above shall prescribe the credits to various types of courses and shall assign title to every course including project work, practical work, field work, self-study elective, as**Foundation Course (FC), Hard Core (HC) or Soft Core (SC) or Open Elective (OE).**

**7.3.** 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) by the BoS concerned. However, following shall be the RULO (REVA Unique Learning Offerings) courses with credits mentioned against them, common to all branches of study. However the BOS of respective program/ discipline shall decide about the total credits for RULO courses.

<b>RULO Courses</b>		
<b>Sl. No.</b>	<b>Course Title</b>	<b>Number of Credits</b>
1	Sports, Yoga, Music, Dance, Theatre	2

2	MOOC / Swayam/ Coursera/Internship	4
3	Soft Skill Training	4
4	Skill Development Course	2
	Total	12

7.4. The concerned BOS shall specify the desired Program Objectives, Program Educational Objectives, Program Specific Outcomes and Course Outcomes while preparing the curriculum of a particular program.

7.5. A candidate can enrol for a maximum of 30 credits and a minimum of 20 credits per Semester. However he / she may not successfully earn a maximum of 30 credits per semester. This maximum of 30 credits does not include the credits of courses carried forward by a candidate.

7.6. Only such full time candidates who register for a minimum prescribed number of credits in each semester from I semester to VI semester and complete successfully 144 credits in 6 successive semesters shall be considered for declaration of Ranks, Medals, Prizes and are eligible to apply for Student Fellowship, Scholarship, Free ships, and such other rewards / advantages which could be applicable for all full time students and for hostel facilities.

## **8. Add-on Proficiency Certification / Diploma:**

### **8.1 Add- on Proficiency Certification:**

To acquire Add on Proficiency Certification a candidate can opt to complete a minimum of 4 extra credits either in the same discipline /subject or in different discipline / subject in excess to 144 credits for the Three Year Graduate degree programs.

### **8.2 Add on Proficiency Diploma:**

To acquire Add on Proficiency Diploma, a candidate can opt to complete a minimum of 18 extra credits either in the same discipline /subject or in different discipline / subject in excess to 144 credits for the Three Year Graduate degree programs.

The Add on Proficiency Certification / Diploma so issued to the candidate contains the courses studied and grades earned.

## **9. Assessment and Evaluation**

- a) Each course is assessed for a total weight of 100%. Out of the total 100% weight; 50% weight is for Continuous Internal Assessment (CIA or IA) and the remaining 50% for the Semester End Examination (SEE). This is applicable for theory, laboratory, workshop, studio and any such courses
- b) Out of 50% weight earmarked for Internal Assessment (IA)- 15% for test-1, 15% for test-2 and 20% for Assignments and this is applicable for theory based courses
- c) The tests and assignments are conducted as per the semester academic calendar provided by the University

**The details as given in the table**

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

Note: IA or CIA includes C1 and C2

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

Students are required to complete courses like technical skills, placement related courses, Open electives and any such value addition or specialized courses through online platforms like SWAYAM/NPTEL/Any other reputed online education aggregator. Students are required to choose the courses on the advice of their course coordinator/Director and required to submit the course completion certificate along with percentage of marks/grade scored in the assessment conducted by the online education aggregator. If the online education aggregator has issued a certificate along with the grade or marks scored to students, such courses will be considered for SGPA calculations, in case the aggregator has issued only a certificate and not marks scored, then such courses will be graded through an examination by concerned School, in case, if grading is not possible, students will be given a pass grade and award the credit and the credits will not be considered for SGPA calculations. The Online/MOOCs courses will not have continuous internal assessment component.

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

Setting question paper and evaluation of answer scripts.

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

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

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

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

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

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

- a) Continuous Internal assessment (CIA) = 50 marks
- b) Semester end practical examination (SEE) = 50 marks

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

i	Conduction of regular practical throughout the semester	20 marks
ii	Maintenance of lab records /industry reports	15 marks
iii	Laboratory test and viva	15 marks
	Total	50 marks

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

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

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



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

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

**10.4. Evaluation of Minor Project / Major Project / Dissertation:**

Right from the initial stage of defining the problem, the candidate has to submit the progress reports periodically and also present his/her progress in the form of seminars in addition to the regular discussion with the supervisor. At the end of the semester, the candidate has to submit final report of the project / dissertation, as the case may be, for final evaluation. The components of evaluation are as follows:

1	First Dissertation presentation describing the problem definition	Should be done a semester before the project semester	Weightage: 0%
2	Dissertation Progress presentation-1	7 <sup>th</sup> week from the start date of project semester	Weightage: 25%
3	Dissertation progress presentation-2	14 <sup>th</sup> Week from the start date of project semester	Weightage -25%
4	Final project Viva and Dissertation Submission	17 <sup>th</sup> -20 <sup>th</sup> Week of project Semester	Weightage: 30% for Dissertation Weightage : 20% for Final Viva Voce

**11. Provision for Appeal**

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

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

- The Registrar (Evaluation) - Ex-officio Chairman / Convener
- One Senior Faculty Member (other than those concerned with the evaluation of the course concerned) drawn from the school / department/discipline and/or from the sister schools / departments/sister disciplines – Member.
- One Senior Faculty Members / Subject Experts drawn from outside the University school / department – Member.

## **12. Eligibility to Appear Semester End Examination (SEE)**

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

### **12.2. Requirements to Pass a Course**

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

## **13. Requirements to Pass the Semester**

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

### **13.1 Provision to Carry Forward the Failed Subjects / Courses:**

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

### **13.2. Provision to Withdraw Course:**

A candidate can withdraw any course within ten days from the date of notification of final results. Whenever a candidate withdraws a course, he/she has to register for the same course in case it is hard core course, the same course or an alternate course if it is Soft Core Course or Open Elective Course. A DROPPED course is automatically considered as a course withdrawn.

### **13.3. Re-Registration and Re-Admission:**

a) In case a candidate's class attendance in aggregate of all courses in a semester is less than 75% or as stipulated by the University, such a candidate is considered as dropped the semester and is not allowed to appear for end semester examination (C3) and he / she shall have to seek re-admission to that semester during subsequent semester / year within a stipulated period.

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

## **14. Attendance Requirement:**

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

**14.2** In case a student is on approved leave of absence (e g:- representing the university in sports, games or athletics, placement activities, NCC, NSS activities and such others) and / or any other such contingencies like medical emergencies, the attendance requirement shall be minimum of 75% of the classes taught

a) Any student with less than 75% of attendance in aggregate of all the courses including practical courses / field visits etc, during a semester shall not be permitted to appear to the end semester (C4) examination and such student shall seek re-admission as provided in 7.8.4

b) Teachers offering the courses will place the above details in the School Board meeting during the last week of the semester, before the commencement of C3, and subsequently a notification pertaining to the above will be brought out by the Director of the School before the commencement of C3 examination. A copy of this notification shall also be sent to the office of the Registrar & Registrar (Evaluation).

**15. Absence during Mid Semester Examination:**

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

**16. Grade Card and Grade Point**

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

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

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

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

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

Here, P is the percentage of marks ( $P = \frac{C1+C2+C3}{\dots}$ ) 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 CGP

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:  $SGPA (S_i) = \frac{\sum(C_i \times G_i)}{\sum C_i}$  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=18
Course 7	2	O	10	2X10=20
Course 8	2	A	8	2X8=16
	24			188

Thus,  $SGPA = 188 \div 24 = 7.83$

##### 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=18
Course 6	3	P	5	3X5=15
Course 7	2	B+	7	2X7=14
Course 8	2	O	10	2X10=20

	24			175
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Thus,  $SGPA = 175 \div 24 = 7.29$

### Illustration No.3

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade point)
Course 1	4	O	10	4 x 10 = 40
Course 2	4	A+	9	4 x 9 = 36
Course 3	3	B+	7	3 x 7 = 21
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	B+	7	3 x 7 = 21
Course 7	2	A+	9	2 x 9 = 18
Course 8	2	A+	9	2 x 9 = 18
	24			199

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

### Cumulative Grade Point Average (CGPA):

Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of the required number of credits (96) for Two year Post Graduate degree program is calculated taking into account all the courses undergone by a student over all the semesters of a program i. e.,

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

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: No.1

CGPA after Final Semester

Semester (ith)	No. of Credits ( $C_i$ )	SGPA ( $S_i$ )	Credits x SGPA ( $C_i \times S_i$ )
1	24	6.83	24 x 6.83 = 163.92
2	24	7.71	24 x 7.71 = 185.04
3	24	8.68	24 x 8.68 = 208.32
4	24	9.20	24 x 9.20 = 220.80
<b>Cumulative</b>	<b>96</b>		<b>778.08</b>

Thus,  $CGPA = \frac{24 \times 6.83 + 24 \times 7.71 + 24 \times 8.68 + 24 \times 9.20}{96} = 8.11$

96

### 16.3.2. CONVERSION OF GRADES INTO PERCENTAGE:

Conversion formula for the conversion of CGPA into Percentage is:

Percentage of marks scored = CGPA Earned x 10

Illustration: CGPA Earned 8.10 x 10=81.0

### 16.3.3. Classification of Results

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

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

**Overall percentage=10\*CGPA**

### 17. Challenge Valuation

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

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

b. With regard to any specific case of ambiguity and unsolved problem, the decision of the Vice-Chancellor shall be final.

**B. Sc., (Mathematics, Statistics, Computer Science)**  
**Scheme 2019-2022**

Sl. No.	Course Code	Course Title	Course Type	Credit Pattern and Value				Weekly Contact Hours	Teaching School/Dept.
				L	T	P	C		
<b>First Semester</b>									
1	B19SM1011	Language – II: Kannada	CC	2	1	0	3	4	Arts and Humanities
2	B19SM1012	Language – II: Hindi							Arts and Humanities
3	B19SM1013	Language – II: Additional English							Arts and Humanities
4	B19SM1020	Functional English - I	CC	2	1	0	3	4	Arts and Humanities
5	B19SM1030	Mathematics-I	HC	2	1	0	3	4	Mathematics
6	B19SM1040	Basic Statistics - I	HC	2	1	0	3	4	Statistics
7	B19SM1050	Problem Solving Techniques using C	HC	2	1	0	3	4	Computer Science
8	B19SM1060	Constitution of India and Professional Ethics	FC	2	0	0	2	2	Legal studies
9	B19SM1070	Mathematics Lab - I	HC	0	0	2	2	3	Mathematics
10	B19SM1080	Basic Statistics Lab - I	HC	0	0	2	2	3	Statistics
11	B19SM1090	C Programming Lab	HC	0	0	2	2	3	Computer Science
<b>Total Credits for the First Semester:</b>							<b>23</b>	<b>31</b>	
<b>Second Semester</b>									
1	B19SM2011	Language – II: Kannada	CC	2	1	0	3	4	Arts and Humanities
2	B19SM2012	Language – II: Hindi							Arts and Humanities
3	B19SM2013	Language – II: Additional English							Arts and Humanities
4	B19SM2020	Functional English - II	CC	2	1	0	3	4	Arts and Humanities
5	B19SM2030	Mathematics-II	HC	2	1	0	3	4	Mathematics
6	B19SM2040	Basic Statistics - II	HC	2	1	0	3	4	Statistics
7	B19SM2050	Data Structures Using C	HC	2	1	0	3	4	Computer Science

8	B19SM2060	Environmental Science	FC	2	0	0	2	2	Chemistry
9	B19SM2070	Sports/Yoga/Music/Dance/ Theatre	RULO	2	0	0	2	2	Physical Education/ Performing Arts
10	B19SM2080	Mathematics Lab - II	HC	0	0	2	2	3	Mathematics
11	B19SM2090	Basic Statistics Lab - II	HC	0	0	2	2	3	Statistics
12	B19SM2X10	Data Structures Lab	HC	0	0	2	2	3	Computer Science
<b>Total Credits for the Second Semester:</b>								<b>25</b>	<b>33</b>

### Third Semester

1	B19SM3011	Language – II: Kannada	CC	2	1	0	3	4	Arts and Humanities
2	B19SM3012	Language – II: Hindi							Arts and Humanities
3	B19SM3013	Language – II: Additional English							Arts and Humanities
4	B19SM3020	Communicative English - I	CC	2	1	0	3	4	Arts and Humanities
5	B19SM3030	Mathematics-III	HC	2	1	0	3	4	Mathematics
6	B19SM3040	Statistical Inference - I	HC	2	1	0	3	4	Statistics
7	B19SM3050	RDBMS	HC	2	1	0	3	4	Computer Science
8	B19SM3060	Classical optimization	OE	4	0	0	4	4	Mathematics
9	B19SM3070	Mathematics Lab - III	HC	0	0	2	2	3	Mathematics
10	B19SM3080	Statistical Inference Lab- I	HC	0	0	2	2	3	Statistics
11	B19SM3090	RDBMS Lab	HC	0	0	2	2	3	Computer Science
<b>Total Credits for the Third Semester:</b>								<b>25</b>	<b>33</b>

### Fourth Semester

1	B19SM4011	Language – II: Kannada	CC	2	1	0	3	4	Arts and Humanities
2	B19SM4012	Language – II: Hindi							Arts and Humanities
3	B19SM4013	Language – II: Additional English							Arts and Humanities
4	B19SM4020	Communicative English – II	CC	2	1	0	3	4	Arts and Humanities
5	B19SM4030	Mathematics-IV	HC	2	1	0	3	4	Mathematics
6	B19SM4040	Statistical Inference – II	HC	2	1	0	3	4	Statistics
7	B19SM4050	Operating System and Shell Program Using LINUX	HC	2	1	0	3	4	Computer Science
8	B19SM4060	Soft Skill Training	RULO	1	1	0	2	3	UIIC
9	B19SM4070	Mathematics Lab – IV	HC	0	0	2	2	3	Mathematics
10	B19SM4080	Statistical Inference Lab- II	HC	0	0	2	2	3	Statistics



11	B19SM4090	LINUX Lab	HC	0	0	2	2	3	Computer Science
<b>Total Credits for the Fourth Semester:</b>								<b>23</b>	<b>32</b>
<b>Fifth Semester</b>									
1	B19SM5010	Mathematics-V	HC	1	1	0	2	3	Mathematics
2	B19SM5020	Mathematics-VI	HC	1	1	0	2	3	Mathematics
3	B19SM5030	Design and Analysis of Experiments	HC	1	1	0	2	3	Statistics
4	B19SM5040	Sampling Theory	HC	1	1	0	2	3	Statistics
5	B19SM5050	JAVA Programming	HC	1	1	0	2	3	Computer Science
6	B19SM5061	Complex Analysis	SC	2	0	0	2	2	Mathematics
	B19SM5062	Fluid Dynamics							
	B19SM5063	Number Theory							
7	B19SM5071	Statistical Quality Control(SQC)	SC	2	0	0	2	2	Statistics
	B19SM5072	Reliability and Survival Analysis							
	B19SM5073	Data Mining							
8	B19SM5081	Web Programming	SC	2	0	0	2	2	Computer Science
	B19SM5082	Visual Programming							
	B19SM5083	Computer Graphics							
9	B19SM5090	Soft Skill Training	RULO	1	1	0	2	3	UIIC
10	B19SM5X10	Design of Experiments Lab	HC	0	0	2	2	3	Mathematics
11	B19SM5X20	JAVA Programming Lab	HC	0	0	2	2	3	Statistics
12	B19SM5X30	Web Programming Lab / Visual Programming Lab / Computer Graphics Lab	HC	0	0	2	2	3	Computer Science
<b>Total Credits for the Fifth Semester:</b>								<b>24</b>	<b>33</b>
<b>Sixth Semester</b>									
1	B19SM6010	Numerical Methods	HC	1	1	0	2	3	Mathematics
2	B19SM6020	Operations Research	HC	1	1	0	2	3	Mathematics
3	B19SM6030	Software Engineering	HC	1	1	0	2	3	Statistics
4	B19SM6041	Fuzzy Mathematics	SC	2	0	0	2	2	Mathematics
	B19SM6042	Topology							
	B19SM6043	Discrete Mathematics and Graph Theory							
5	B19SM6051	Applied Statistics	SC	2	0	0	2	2	Statistics
	B19SM6052	Econometrics							
	B19SM6053	Actuarial Statistics							
6	B19SM6061	Computer Networks	SC	2	0	0	2	2	Computer Science
	B19SM6062	Design and Analysis of Algorithms							
	B19SM6063	Computer Architecture							
7	B19SM6070	MOOCs-Swayam/NPTEL /EDx/COURSERA	RULO	0	0	2	2	3	Others

8	B19SM6080	Skill Development Courses	RULO	1	1	0	2	3	UIIC
9	B19SM6090	Mathematics-V Lab	HC	0	0	2	2	3	Mathematics
10	B19SM6X10	Numerical Methods – Lab	HC	0	0	2	2	3	Mathematics
11	B19SM6X20	Operations Research Lab	HC	0	0	2	2	3	Statistics
12	B19SM6X30	Computer Science Project Work	HC	0	0	2	2	3	Computer Science
<b>Total Credits for the Sixth Semester:</b>								<b>24</b>	<b>33</b>
<b>Total Credits of all Semesters:</b>								<b>144</b>	<b>195</b>

## Detailed Syllabus

### Semester I:

<b>B19SM1011</b>	<b>Language-II:Kannada</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:

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

### Course Objectives:

The objectives of this course are to:

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

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

### Course Outcomes:

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

ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತಿಗತಿಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

1. ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
2. ಜೀವನದಲ್ಲಿ ಬರುವಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
3. ಸಾಮಾಜಿಕಅರಿವು ಮೂಡಿಸುತ್ತದೆ
4. ಉತ್ತಮಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.

### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM1011	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		

### Course Contents:

#### Unit-I:

[12 Hrs]

1. ಸತ್ಯವಂತೆ ಹಡೆದವ್ವ - ಜನಪದಗೀತೆ
2. ನೆಲಸುಗೆ ನಿನ್ನ ವಕ್ಷದೊಳೆ - ಪಂಪ
3. ಕುಡು ಚಪಳೆ ಜಪದ ಮಣಿಯಂ - ನಾಗವರ್ಮ
4. ಚಿತ್ರಮಹಾತ್ಮರಮತೆ ನಾರಿ - ಜನ್ನ nu

#### Unit-II:

[12 Hrs]

1. ಅಭಿಯುಮೋರ್ವೆ ಕಾಲವಶದಿಂ ಮರ್ಯಾದೆಯಂದಾಂಟದೇ.... - ನಾಗಚಂದ್ರ
2. ವಚನಗಳು - ಅಕ್ಕಮಹಾದೇವಿ
3. ವಚನಗಳು - ಬಸವಣ್ಣ
4. ಗುಂಡಯ್ಯನ ರಗಳೆ - ಹರಿಹರ

#### Unit-III:

[12 Hrs]

1. ದುಷ್ಟಬುದ್ಧಿಯುಂಧರ್ಮಬುದ್ಧಿಯುಂ - ದುರ್ಗಸಿಂಹ
2. ಕಲ್ಮಡಿಯಕೋಣ - ಮಾಸ್ತಿ
3. ಯಾರೂಅರಿಯದ ವೀರ - ಕುವೆಂಪು
4. ಸಮಸ್ಯೆಯ ಮಗು - ತ್ರಿವೇಣಿ

#### Unit-IV:

[12 Hrs]

1. ಟೊಳ್ಳುಗಟ್ಟಿ - ಟಿ.ಪಿ. ಕೈಲಾಸಂ

### ಪಠ್ಯಪುಸ್ತಕ ಗ್ರಂಥಗಳು:

1. ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರುಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸಂಗ್ರಹ. ನಾಗೇಗೌಡಎಚ್.ಎಲ್., ಚಾರಿತ್ರಿಕಜನಪದಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರಕಾಶಕರುಕರ್ನಾಟಕಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2008
3. ಸೀಮಾತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
4. ಸಂಗ್ರಹ. ನಾಗೇಗೌಡಎಚ್.ಎಲ್., ಕನ್ನಡಜನಪದಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರಕಾಶಕರುಕರ್ನಾಟಕಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2007

5. ಹಂಪ ನಾಗರಾಜಯ್ಯ, ಸಾಂಗತ್ಯ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
6. ನಾರಾಯಣಪಿ.ವಿ, ಚಂಪೂ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
7. ಕಾಳೇಗೌಡ ನಾಗವಾರ, ತ್ರಿಪದಿ, ರಗಳೆ ಮತ್ತುಜಾನಪದ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
8. ಸಂ. ಬೆನಗಲ್‌ರಾಮರಾವ್ ಮತ್ತು ಪಾನ್ಯಂ ಸುಂದರ ಶಾಸ್ತ್ರಿ, ಪುರಾಣ ನಾಮ ಚೂಡಾಮಣಿ, ಪ್ರಕಾಶಕರು ಪ್ರಸಾರಾಂಗ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ. 2010
9. ಡಾ. ಚಿದಾನಂದ ಮೂರ್ತಿ, ವಚನ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013
10. ಸಂ. ಬಸವರಾಜುಎಲ್. ಸರ್ವಜ್ಞನ ವಚನಗಳು, ಪ್ರಕಾಶಕರುಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2012
11. ಸಂ. ಬಸವರಾಜುಎಲ್. ಅಕ್ಕನ ವಚನಗಳು, ಪ್ರಕಾಶಕರುಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 1997
12. ಸಂ ಮರುಳಸಿದ್ದಪ್ಪ ಕೆ, ನಾಗರಾಜಕಿ.ರಂ. ವಚನ ಕಮ್ಮಟ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
13. ನರಸಿಂಹಾಚಾರ್. ಡಿ.ಎಲ್., ಪಂಪ ಭಾರತ ದೀಪಿಕೆ, ಪ್ರಕಾಶಕರುಡಿ.ವಿ.ಕೆ ಮೂರ್ತಿ ಪ್ರಕಾಶನ, ಮೈಸೂರು. 2012
14. ರಂಜಾನ್‌ದರ್ಗಾ, ಶರಣರ ಸಮಗ್ರಕ್ರಾಂತಿ, ಪ್ರಕಾಶಕರು. ಲೋಹಿಯಾ ಪ್ರಕಾಶನ, ಬಳ್ಳಾರಿ. 2015
15. ದೇಶಪಾಂಡೆಎಸ್.ಎಲ್. ಬೇಂದ್ರೆ ಶರೀಫರಕಾವ್ಯಾಯಾನ, ಪ್ರಕಾಶಕರು ದೇಸಿ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2013
16. ಸಂ. ಬಿ.ಎಸ್. ಕೇಶವರಾವ್. ಕೈಲಾಸಂ ಕನ್ನಡ ನಾಟಕಗಳು, ಪ್ರಕಾಶಕರುಅಂಕಿತ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2005
17. ಶಾಮರಾಯತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು -2014
18. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

<b>B19SM1012</b>	<b>Language-II:Hindi</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:

#### अध्ययन वर्णन :

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

### Course Objectives:

The objectives of this course are to:

#### पाठ्यक्रम उद्देश्य :

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

### Course Outcomes:

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

#### अध्ययन की समाप्ति पर अध्येता :

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

### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM1012	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			

#### Course Contents:

**इकाई – 1:** कहानी, संस्मरण [12 Hrs]  
 कहानी – नशा-प्रेमचंद  
 कहानी – सुखमयजीवन-चंद्रधरशर्मागुलेरी  
 संस्मरण – शरतकेसाथबितायाकुछसमय – अमृतलालनागर

**इकाई – 2:** कहानी, आत्मकथा [12 Hrs] कहानी-  
 मरनेसेपहले-भीष्मसाहनी  
 कहानी-लालहवेली-शिवानी  
 आत्मकथा-जेल-जीवनकीझलक -गणेशशंकरविद्यार्थी

**इकाई – 3:** कहानी, व्यंग्यरचना [12 Hrs]  
 कहानी-चायकाएकप्याला-कैथरीनमैन्सफील्ड  
 व्यंग्यरचना-भेड़ेऔरभेड़ियें – हरिशंकरपरसाई

**इकाई – 4:** अनुवाद, संक्षेपण [12 Hrs]  
**अनुवाद :** अंग्रेज़ी – हिन्दी(शब्दएवंअनुच्छेद )  
**संक्षेपण :** परिच्छेदकाएकतिहाईभागमें |

**सूचना :** प्रत्येकइकाई 25 अंककेलिएनिर्धारितहै |

#### References:

1. सुबोधव्यवहारिकहिन्दी-डॉ. कुलदीपगुप्त
2. अभिनवव्यवहारिकहिन्दी-डॉ.परमानन्दगुप्त
3. हिन्दीसाहित्यकाइतिहास - डॉ. नागेन्द्र
4. आधुनिकहिन्दीसाहित्यकाइतिहास - डॉ. बच्चनसिंह
5. हिन्दीसाहित्यकानवीनइतिहास - डॉ. लालसाहबसिंह
6. शुद्धहिन्दीकेसेबोलेकेसेलिखे- पृथ्वीनाथपाण्डे
7. कार्यालयअनुवादनिदेशिका
8. संक्षेपणऔरपल्लवन - के.सी.भाटिया&तुमनसिंग

B19SM1013	Language-II:Additional English	L	T	P	C
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<b>Duration:14 Wks</b>		<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>
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**Prerequisites:**

Knowledge of intermediate English Grammar and LSRW skills.

**Course Objectives:**

The objectives of this course are to:

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:**

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

1. Demonstrate a thorough understanding of sensitive and critical social issues.
2. Develop reading skills and 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>B19SM1013</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: 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 & Super Natural** **[12 Hrs]**

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 and 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, Arun Kolatkar, Dilip Chitre, R. Parthasarathy*. Atlantic Publications, 2011.
6. Dickens, Charles. *The Signalman and Other Horrors: The Best Victorian Ghost Stories of Charles Dickens: Volume 2*. Createspace Independent Publications, 2015.
7. Anderson, Hans Christian. *The Fir Tree*. Dreamland Publications, 2011.
8. Colvin, Sidney (ed). *The Works of R. L. Stevenson. (Edinburgh Edition)*. British Library, Historical Prints Edition, 2011.
9. Bishop, Elizabeth. *Poems*. Farrar, Straus and Giroux, 2011.
10. Swift, Jonathan. *Gulliver's Travels*. Penguin, 2003.
11. Dickinson, Emily. *The Complete Poems of Emily Dickinson*. Createspace Independent Publications, 2016.
12. Brooke, Rupert. *The Complete Poems of Rupert Brooke*. Andesite Press, 2017.
13. King, Martin Luther Jr. & James M. Washington. *I Have a Dream: Writings and Speeches That Changed The World*. Harper Collins, 1992.
14. Keller, Helen. *The Story of My Life*. Fingerprint Publishing, 2016.
15. Green, David. *Contemporary English Grammar Structures and Composition*. New Delhi: MacMillan Publishers, 2010.
16. Thorpe, Edgar and Showick Thorpe. *Basic Vocabulary*. Pearson Education India, 2012.
17. Leech, Geoffrey and Jan Svartvik. *A Communicative Grammar of English*. Longman, 2003.
18. Murphy, Raymond. *Murphy's English Grammar with CD*. Cambridge University Press, 2004.

<b>B19SM1020</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:**

The objectives of this course are to:

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:**

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

1. Interpret audio files and comprehend different spoken discourses/ excerpts in different accents.
2. Demonstrate speaking ability with clarity, confidence and comprehension and communicate with one or many listeners using appropriate communicative strategies.
3. Make use of reading different genres of texts adopting various reading strategies.
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.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM1020	CO1					3	3	3	1		
	CO2					3	3	3	2		
	CO3					3	3	3	2		
	CO4					3	3	3	1		

**Course Contents:**

**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>B19SM1030</b>	<b>Mathematics-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:**

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

**Course Objectives:**

The objectives of this course are to:

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:**

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

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
B19SM1030	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<sup>th</sup> 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

$\int \sin^n x dx, \int \cos^n x dx, \int \tan^n x dx, \int \cot^n x dx, \int \sec^n x dx, \int \operatorname{cosec}^n x dx$  &  $\int \sin^m x \cos^n x dx$ , 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, Text book 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, 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 examples, Reprint. Charleston, USA: BiblioBazaar, 2010.

<b>B19SM1040</b>	<b>Basic Statistics-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 basic mathematics-addition, subtraction, multiplication, division; probability basics, graphs.

**Course Objectives:**

The objectives of this course are to:

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

**Course Outcomes:**

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

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

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM1040</b>	<b>CO1</b>	2	3	2	2	1	2	1	1	3	2
	<b>CO2</b>	2	3	2	3	1	2	1	1	2	3
	<b>CO3</b>	3	3	2	3	1	2	1	1	2	2
	<b>CO4</b>	2	2	2	3	2	2	1	1	2	2

**Course Contents:**

**Unit-1: Statistical Methods****[12 Hrs]**

Statistics - Meaning, Importance and Scope of Statistics. Concepts of statistical population and sample. Collection of data: Primary and Secondary data. Types of measurements: Nominal, Ordinal, Ratio and Interval. Classification and tabulation - Construction of statistical table and Frequency distribution. Graphical representation of data.

**Unit-2: Univariate Data Analysis:****[12 Hrs]**

Measures of central tendency: Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean and their properties. Quantiles: Quartiles, Deciles, Percentiles. Absolute and relative measures of dispersion: Range, Standard deviation, Mean deviation, Quartile Deviation, Coefficient of variation and their properties. Moments: Raw and central moments, Properties and Relationship between them. Skewness and kurtosis: Concept, Measures and Properties.

**Unit-3: Elements of Probability****[12 Hrs]**

Random experiment, Trial, Sample point, Sample space, Event, Operations on events. Classical and relative frequency approach to probability - Axiomatic approach to probability. Simple problems. Addition theorem of probability, Conditional probability, Independence of events multiplication theorem - Bayes theorem and its applications.

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

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

**An introduction to R-Software:** Computer software and utility, Statistical softwares, R-software. Essentials, Advantages, Expressions and objects. Functions and arguments, Materials and arrays, Factors, Data entry regarding from a text file, the data editor, interfacing to other programmes. Descriptive statistics and graphics-Summary statistics, Graphical display of distributions.

**Text books:**

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

**Reference Books:**

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

<b>B19SM1050</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>

### Prerequisites:

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 this course the student will be able to:

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

### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM1050</b>	<b>CO1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>0</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>0</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>0</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>

	CO4	3	3	3	2	2	0	0	0	2	2
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**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.Kanetkar, 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>B19SM1060</b>	<b>Constitution of India and Professional</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>

### Course Objectives:

The objectives of this course are to:

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

### Course Outcomes:

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

1. On completion of this course the student will be able to:
2. Strengthen the knowledge on Indian constitutional law and make the practical implementation of it.
3. Understand the fundamental rights and human rights.
4. Get the knowledge to explain the duties and more importantly practice it in a right way.
5. 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.
6. Get exposed about professional ethics and know about etiquettes about it.
7. Know about 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>B19SM1060</b>	<b>CO1</b>	3	3	2	2					2	3
	<b>CO2</b>	3	2	2	3					3	2
	<b>CO3</b>	3	2	3	2					3	2
	<b>CO4</b>	3	3	3	2					3	3

### Course Contents:

#### Unit -I: Constitution of India

[6 Hrs]

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 [6Hrs]**

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.

**Text books:**

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

<b>B19SM1070</b>	<b>Mathematics 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>

**Prerequisites:**

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

**Course Objectives:**

The objectives of this course are to:

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:**

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

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
B19SM1070	CO1	3	2	2		1				3	3
	CO2	3	2	2		1				3	3
	CO3	2	2	2		1				2	3
	CO4	3	2	2		1				3	2

### Lab Experiments

1. 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.

#### Text Books:

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.

B19SM1080	Basic Statistics Lab-I	L	T	P	C
Duration: 14 Wks		0	0	2	2

#### Prerequisites:

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

basics, graphs.

### Course Objectives:

The objectives of this course are to:

1. Have the basic knowledge of collection and tabulation of data.
2. Describe the univariate and bivariate data analysis.
3. Understand the concepts of probability.
4. Explore the basics of R software.

### Course Outcomes:

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

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

### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM1080	CO1	2	3	2	2	1	2	1	1	3	2
	CO2	2	3	2	3	1	2	1	1	2	3
	CO3	3	3	2	3	1	2	1	1	2	2
	CO4	2	2	2	3	2	2	1	1	2	2

### Lab Experiments

#### (Demonstration of practicals using R-software)

1. Construction of frequency distribution and graphical representation.
2. Measures of central tendency I (Mathematical averages).
3. Measures of central tendency II (Positional averages & Partition values).
4. Measures of dispersion I (Range, QD, MD,SD and CV).
5. Moments, skewness, and kurtosis for a frequency distribution.
6. Fitting of first, second, exponential and geometric curves.
7. Correlation and regression for ungrouped data and Spearman's rank correlation coefficient.
8. Correlation and regression for grouped data.
9. Computation of probabilities using combinatorial methods.
10. Application of addition rule, conditional probability, Baye's formula.

#### Text books:

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

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

**Reference Books:**

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

<b>B19SM1090</b>	<b>C Programming Lab</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:**

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 have to have communication, reading and apprehension skills of English.

**Course Objectives:**

The objectives of this course are to:

1. Make the student learn a programming language.
2. Learn problem solving techniques.
3. Teach the student to write programs in C and to solve the problems.

**Course Outcomes:**

On 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	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM1090	CO1	3	3	3	3			2	3	3	2
	CO2	3	3	3	3			2	3	3	3
	CO3	3	3	3	2			2	3	3	3
	CO4	3	3	3	2				1	3	2

### Lab Experiments

#### PART – A

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.
3. Write a Program to find the GCD and LCM of two integer numbers.
4. Write a C Program that reverse a given integer number and check whether the number is a palindrome or not.
5. Write a Program to find whether a given number is a prime number or not.
6. Write a C program to arrange the given set of numbers in ascending and descending order.
7. Write a C Program to read two matrices and perform addition and subtraction of two matrices.
8. Write a C Program to read a string and check whether it is a palindrome or not.
9. Write a Program to find the factorial of a number using a function.
10. Write a C program to demonstrate the user-defined header file.

#### PART – B

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

#### Reference Books:

1. Problem Solving and Program Design in C, 4th edition, by Jeri R. Hanly and Elli B. Koffman.
2. P.V.P. Siddhartha Institute of Technology (Autonomous), I B.Tech. Syllabus under PVP14 regulations.
3. Programming in C by Pradip Dey, Manas Ghosh 2nd edition Oxford University Press.
4. E. Balaguruswamy, Programming in ANSI C 5th Edition McGraw-Hill.

## Semester: II

<b>B19SM2011</b>	<b>Language-II:Kannada</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:

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

## Course Objectives:

The objectives of this course are to:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಎರಡನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಲೇಖನಗಳು ಹಾಗೂ ಪ್ರವಾಸಕಥನ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

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

## Course Outcomes:

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

ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಲೇಖನಗಳು ಹಾಗೂ ಪ್ರವಾಸಕಥನ ಸಾಹಿತ್ಯಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

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

### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM2011	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		

### Course Contents:

#### Unit-I: ಮಧ್ಯಕಾಲೀನಕಾವ್ಯ

[12 Hrs]

1. ಚಂದ್ರಮತಿ ವಿಲಾಪ - ರಾಘವಾಂಕ
2. ಹಗೆಗಳನು ಹಿಂಡಿದನು ಮನದೊಳಗೆ - ಕುಮಾರವ್ಯಾಸ
3. ಮುಳ್ಳೆಡಿದ ಮರನೇರಿದಂತಾದುದು - ಲಕ್ಷ್ಮೀಶ
4. ಗೋರಕ್ಷ ಪ್ರಸಂಗ - ಚಾಮರಸ

#### Unit-II: ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯ

[12 Hrs]

1. ತ್ರಿಪದಿಗಳು - 'ವರ್ಜ್ಜ' ಹಳವನ
2. ಮುಂದಕ್ಕೆ ಲೇಸುಂಟು ನಮಗೆ - ಕಟ್ಟಿಗಿರಿಯಮ್ಮ
3. ಗುರುವಿನ ಗುಲಾಮನಾಗುವ ತನಕ - ಪುರಂದರದಾಸರು
4. ಕರೆದುಕೊಟ್ಟನು ಶಾಪವನು - ಕನಕದಾಸರು

#### Unit-III: ಲೇಖನಗಳು

[12 Hrs]

1. ಮೋಕ್ಷ ಹುಡುಕುತ್ತ ಪ್ರೀತಿಯ ಬಂಧನದಲ್ಲಿ - ಪಿ. ಲಂಕೇಶ
2. ರಾಮ-ಕೃಷ್ಣ-ಶಿವ - 'ಗೋಪಿಯಾ
3. ಮಾನವೀಯತೆ ಅಂತಾರಲ್ಲಾ - ದೇವನೂರು ಮಹಾದೇವ
4. ಭೂತಾಯಿ ಮುನಿದಾಳು - ಮುರಾರಿ ಬಲ್ಲಾಳ

#### Unit-IV: ಪ್ರವಾಸಕಥನ

[12 Hrs]

ನನ್ನೊಳಗಿನ ಹಾಡುಕೊಬ್ಬಾ - ಜಿ.ಎನ್. ಮೋಹನ್

#### ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು :

1. ಮುಗಳಿ ರಂಶ್ರೀ, ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರುಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014

2. ಸೀಮಾತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
3. ಹಂಪ ನಾಗರಾಜಯ್ಯ, ಸಾಂಗತ್ಯ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
4. ಕಾಳೇಗೌಡ ನಾಗವಾರ, ತ್ರಿಪದಿ, ರಗಳೆ ಮತ್ತುಜಾನಪದ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
5. ಸಂ. ಬೆನಗಲ್‌ರಾಮರಾವ್ ಮತ್ತು ಪಾನ್ಯಂ ಸುಂದರ ಶಾಸ್ತ್ರಿ, ಪುರಾಣ ನಾಮ ಚೂಡಾಮಣಿ, ಪ್ರಕಾಶಕರು ಪ್ರಸಾರಾಂಗ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ. 2010
6. ಸಂ. ಬಸವರಾಜುಎಲ್. ಸರ್ವಜ್ಞನ ವಚನಗಳು, ಪ್ರಕಾಶಕರುಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2012
7. ಮರುಳಸಿದ್ದಪ್ಪ ಕೆ, ಷಟ್ಪದಿ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
8. ಸಂ. ಸೇತುರಾಮರಾವ್‌ಅ.ರಾ., ಶ್ರೀ ಲಕ್ಷ್ಮೀಶನಚೈಮಿನಿ ಭಾರತ(ಮೂಲ-ತಾತ್ಪರ್ಯ-ಸಚಿತ್ರ), ಪ್ರಕಾಶಕರುಕಾಮಧೇನು ಪುಸ್ತಕ ಭವನ, ಬೆಂಗಳೂರು. 2010
9. ಸಂ. ಜಿ.ಎಸ್.ಭಟ್., ಕುಮಾರವ್ಯಾಸನಕರ್ಣಾಟ ಭಾರತಕಥಾಮಂಜರಿ ಪ್ರವೇಶ, ಪ್ರಕಾಶಕರುಅಕ್ಷರ ಪ್ರಕಾಶನ, ಹೆಗ್ಗೋಡು, ಸಾಗರ. 2006
10. ಕೀರ್ತನಾಧಿಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರುಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್‌ಟ್ರಸ್ಟ್, ಧಾರವಾಡ. 2009
11. ಶಾಮರಾಯತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು -2014
12. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

<b>B19SM2012</b>	<b>Language-II: Hindi</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:

1. ಅध्येता, पी.यु.सीकेस्तरपरद्वितीयभाषाकेरूपमेंहिन्दीकाअध्ययनकरनाचाहिए।
2. हिन्दीसाहित्यकेइतिहासकासंक्षिप्तज्ञानकीआवश्यकताहै।
3. हिन्दीव्याकरणकाअवबोधनआवश्यकहै।
4. हिन्दी-अंग्रेजीअनुवादसेसंबंधितजानकारीजरुरीहै।

### Course Objectives:

The objectives of this course are to:

1. संदर्भानुसारउचितभाषाकाप्रयोगकरनेकीदक्षताकोछात्रोंमेंउत्पन्नकरना।
2. साहित्यकेमाध्यमसेसमाजएवंमानवीयमूल्योंकोसमझाकर, उनमूल्योंकीरक्षाहेतुप्रेरितकरना।
3. छात्रोंमेंपुस्तकपठनएवंलेखनकीअकृतिमप्रवृत्तिस्थापितकरना।
4. अध्येताओंमेंसाहित्यकेमाध्यमसेप्रभावीएवंकुशलसंचारकाविकासकरना।

### Course Outcomes:

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

अध्ययनकीसमाप्तिपरअध्येता –

1. सामाजिकमूल्यएवंनैतिकजवाबदेहीकोस्वीकारकरसकताहै।
2. साहित्यकीप्रासंगिकताकोजीवनमेंसमझनेकीदक्षतारखताहै।
3. समाजमेंअंतर्निहितपद्धतियाँएवंविचारधाराओंकाव्याख्यानकरनेमेंसक्षमबनसकताहै।

4. साहित्यकेमाध्यमसेप्रभावीएवंकुशलसंचारकाविकासकरसकताहै।

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM2012	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			

**Course Contents:**

**इकाई – 1:** प्राचीनकविता, आधुनिककविता [12 Hrs]

कबीरकेदोहे

कविता –जलियाँवालाबागमेंबसंत- सुभद्राकुमारीचौहान

कविता –सुभाषकीमृत्युपर - धर्मवीरभारती

**इकाई – 2:** मध्यकालीनकविता, आधुनिककविता [12 Hrs]

रसखानकेदोहे

कविता –हमारीजिन्दगी -केदारनाथअग्रवाल

कविता –चलनाहमाराकामहै।-शिवमंगलसिंहसुमन

**इकाई – 3:** मध्यकालीनकविता, आधुनिककविता [12 Hrs]

मीराबाईकेपद

कविता –मेरेसपनेबहुतनहींहैं-गिरिराजकुमारमाथुर

कविता –अभीनहोगामेराअंत – निराला

**इकाई – 4:** अनुवाद, निबंध [12 Hrs]

**अनुवाद :** हिन्दी – अंग्रेजी

**निबंध:**

1. भारतमेंकिसानोंकीस्थिति
2. निर्वाचनआयोगकामहत्व
3. प्रेसकीआजादीकितनीसार्थक
4. भारतीयनारी
5. साहित्यकाउद्देश्य

**References:**



1. पाठ्यपुस्तक – रेवाविश्वविद्यालय
2. सुबोधव्यवहारिकहिन्दी – डॉ. कुलदीपगुप्त
3. अभिनवव्यवहारिकहिन्दी – डॉ.परमानन्दगुप्त
4. हिन्दीसाहित्यकाइतिहास - डॉ. नागेन्द्र
5. आधुनिकहिन्दीसाहित्यकाइतिहास - डॉ. बच्चनसिंह
6. हिन्दीसाहित्यकानवीनइतिहास - डॉ. लालसाहबसिंह
7. शुद्धहिन्दीकैसेबोलेकैसेलिखे- पृथ्वीनाथपाण्डे
8. कार्यालयअनुवादनिदेशिका
9. हिन्दीनिबंधसंग्रह

<b>B19SM2013</b>	<b>Language-II:Additional English</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 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:

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

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>B19SM2013</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>		

	CO4					3	3	3	2		
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## Course Contents:

### Unit – I [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 [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 [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 [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.
6. Manohar, Murli. *Critical Essays on Dalit Literature*. Atlantic Publishers, 2013.
7. Hansda, SowvendraShekhar. *The Adivasi Will Not Dance: Stories*. Speaking Tiger Publishing Private Limited, 2017.
8. Jacobs, Harriet. *Incidents in the Life of a Slave Girl*. Createspace Independent Publication, 2014.
9. Das, Kamala. *Selected Poems*. Penguin Books India, 2014.
10. Tagore, Rabindranath. *Selected Short Stories of Rabindranath Tagore*. Maple Press, 2012.
11. Gale, Cengage Learning. *A Study Guide for Jamaica Kincaid's Girl*. Gale, Study Guides, 2017.
12. Kipling, Rudyard. *The Absent-Minded Beggar*. Hardpress Publishing, 2013.
13. Doyle, Arthur Conan. *The Hound of the Baskervilles*. General Press, 2017.
14. Dixon, Robert J. *Everyday Dialogues in English*. Prentice Hall India Pvt Ltd., 1988.
15. Turton, Nigel D. *ABC of Common Errors*. Mac Millan Publishers, 1995.
16. Samson, T. (ed.) *Innovate with English*. Cambridge University Press, 2010.
17. Kumar, E Suresh, J. Savitri and P Sreehari (ed). *Effective English*. Pearson Education, 2009.

<b>B19SM2020</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 completion of the course, learners will be able to:

1. Interpret audio files and comprehend different spoken discourses/ excerpts in different accents.
2. Demonstrate speaking ability with clarity, confidence and comprehension and communicate with one or many listeners using appropriate communicative strategies.
3. Make use of reading different genres of texts adopting various reading strategies.
4. Develop the ability to write cohesively, coherently and flawlessly avoiding grammatical errors

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM2020</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>1</b>		
	<b>CO4</b>					<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>		

**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 our friend to a function, congratulating someone for his / her success, thanking one's friend's relatives).

**Unit – III** **[12 Hrs]**

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

**Unit – IV** **[12 Hrs]**

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

**Reference Books:**

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

<b>B19SM2030</b>	<b>Mathematics-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:**

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

**Course Objectives:**

The objectives of this course are to:

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

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

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
B19SM2030	CO1	3	2	2				1	1	3	2
	CO2	2	2	2				1	1	3	3
	CO3	3	2	2				1	1	3	3
	CO4	3	2	2				1	1	3	2

## Course Contents:

### Unit – I: Group Theory-1

[12 Hrs]

Binary operations, 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, Any group of order less than five is abelian, permutation groups.

### Unit-II: Differential Calculus -2

[12 Hrs]

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

[12 Hrs]

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.

## 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 examples, Reprint. Charleston, USA: BiblioBazaar, 2010.
5. M D Raisinghania, Ordinary and Partial Differential Equations, S Chand and Co. Pvt. Ltd., 2014.

<b>B19SM2040</b>	<b>Basic Statistics-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 basics statistics-I, basics mathematics, differentiation, and integration.

**Course Objectives:**

The objectives of this course are to:

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

**Course Outcomes:**

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

1. Describe the univariate and bivariate random variables using probability.
2. Identify the various distributions (changed the added co-2 mapping)
3. Analyze the probability distributions.
4. Investigate the applications of limit theorems.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM2040</b>	<b>CO1</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>2</b>
	<b>CO2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>

	<b>CO3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>3</b>
	<b>CO4</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>3</b>

### Course Contents:

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

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

#### **Unit-2: Discrete probability distributions [12 Hrs]**

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

#### **Unit-3: Continuous probability distributions [12 Hrs]**

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

#### **Unit-4: [12 Hrs]**

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

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

#### **Text books:**

1. Walpole, R.E., Myers, R.H., and Myers, S.L. (2017). *Probability and Statistics for Engineers and Scientists*, 9/e, Pearson, New Delhi.
2. Mukhopadhyay, P.(2015): *Mathematical Statistics*, Books and Allied Pvt Ltd., Kolkata.
3. V.K Rohatgi and A.K Saleh Md. E. An Introduction to Probability and Statistics, 2<sup>nd</sup> Edn. (Reprint). John Wiley and Sons, 2009.
4. W.J DeCoursey, *Statistics and Probability for Engineering Applications*, Elsevier Science (USA), 2009.
5. AS Gaur and SS Gaur, *Statistical Methods for practice and Research: A guide to data analysis using SPSS*, 2<sup>nd</sup> Edition, Sage Publications Ltd, 2009.
6. S.C Gupta and V.K Kapoor, *Fundamentals of Mathematical Statistics*, 11th Edn., (Reprint), Sultan Chand and Sons, 2007.
7. Miller, Irwin and Miller, Marylees, John E. Freund's *Mathematical Statistics with Applications*, (7th Edn.), Pearson Education, Asia, 2006.
8. Gupta S.C and Kapoor V.K: (2006). *Fundamental Mathematical Statistics*, Sultan Chand and Sons 88, Daryaganj , New Delhi.

9. Spiegel, M.R. (2001).*Probability and Statistics*, 4/e, Schaum's Outline Series, McGraw Hill, London.
10. Hogg, R. V. and Craig, A.T. (1995).*Introduction to Mathematical Statistics*, 5/e, Prentice Hall, New Jersey, USA.
11. Medhi, J. (1992).*Statistical Methods: An introductory text*, New Age International, New Delhi.
12. Goon A.M., Gupta, M.K., Das Gupta, B. (1991).*Fundamentals of Statistics*, Vol.I, World Press, Calcutta

**Reference Books:**

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

<b>B19SM2050</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:**

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. 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.

**Course Outcomes:**

On completion of this course the student will 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.
4. Use different kinds of data structures which are suited to different kinds of applications, and



some are highly specialized to specific tasks.

### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM2050	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

#### Course Contents:

##### 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, represent 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>B19SM2060</b>	<b>Environmental Science</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:**

The objectives of this course are to:

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

**Course Outcomes:**

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

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

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM2060</b>	<b>CO1</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>
	<b>CO2</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>
	<b>CO3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>
	<b>CO4</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>

**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 waste water treatment processes.

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

**Solid Waste management** – Municipal solid waste, biomedical waste, Industrial solid waste and Electronic waste (E-Waste).

**Self study:** Disaster management, early warning systems-bio indicators for Tsunami and other 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.M. S. Reddy & Chandrashekar, REVA University.
3. “Environmental Studies”, by R.J. Ranjit Daniels and JagadishKrishnaswamy, (2009), Wiley India Private Ltd., New Delhi.
4. “Environmental Studies” by Benny Joseph, Tata McGraw – Hill Publishing Company Limited.
5. Environmental Studies by Dr.S.M. Prakash, Elite Publishers Mangalore, 2007
6. Rajagopalan R. 2005, “Environmental Studies – from Crisis to cure”, Oxford University Press.
7. Environmental Science by Arvind walia, Kalyani Publications, 2009.
8. Environmental Studies by AnilkumarDey and Arnab kumarDey.

<b>B19SM2070</b>	<b>Sports/Yoga/Music/Dance/Theatre</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>

**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 have to choose any **ONE** of these courses.

**A. YOGA FOR HEALTH****Course Objectives:**

The objectives of this course are to:

1. Prepare the students for the integration of their physical, mental and spiritual faculties;
2. Enable the students to maintain good health;
3. Practice mental hygiene and to attain higher level of consciousness;
4. Possess emotional stability, self control and concentration
5. To inculcate among students self discipline, moral and ethical values.

**Course Outcomes:**

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

1. Practice yoga for strength, flexibility, and relaxation.
2. Learn techniques for increasing concentration and decreasing anxiety
3. Become self disciplined and self-controlled
4. Improve physical fitness and perform better in studies

**Course Contents:**

**Unit-I:**

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

**Unit-II:**

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

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

**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:**

The objectives of this course are to:

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 this course the student 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 Contents:****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:**

The objectives of this course are to:

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 Contents:**

#### **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:**

The objectives of this Course are to:

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 this course the student 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 Contents:**

#### **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:**

The objectives of this course are to:

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 Contents:****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**

### **Prerequisites:**

Students with background in Theatre Arts/ Keen interest in Dramatics.

### **Course Objectives:**

The objectives of this course are to:

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

### **Course Outcomes:**

On successful completion of this course students shall be able to:

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

### **Course Contents:**

#### **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.

### **Course Objectives:**

The objectives of this course are to:

1. To develop an understanding about the Indian classical dance forms and its universal application.
2. To be able to understand the fine nuances of Classical dance.
3. To understand the importance of health through Indian classical dance, strengthen the body capacity.
4. To understand mythology and its characters in Indian classical dance form through lessons of Abhinaya.
5. Shall also be able to understand voice modulation and Navarasas.

### **Course Outcomes:**

On successful completion of this course students shall be able to:

1. To be able to identify and appreciate the classical dance forms.
2. To be able to execute basics of Adavus with finesse.
3. To be able to express through abhinaya.
4. To be crafting, music, dance, costume and lighting.

### **Course Contents:**

#### **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)**

**Prerequisites:**

Students with background in Percussion instruments and knowledge of Rhythm/ Keen interest in studying Mridagam / Tabala.

**Course Objectives:**

The objectives of this course are to:

1. Understand the Rhythmology.
2. Understand the importance of Laya, Taala.
3. Understand voice modulation and Navarasas.

**Course Outcomes:**

On successful completion of this course students shall be able to:

1. Set instrument to Sruthi.
2. Play the fundamentals on instrument.
3. Learn and perform a particular taala.
4. Craft, music, dance, costume and lighting.

**Course Contents:**

**UNIT 1**

Introduction to Musical Instruments  
Percussion Instruments  
Mridangam and its History

**UNIT 2**

Introduction to Tala System  
Definitions of 5 jaathis and their recitation  
Adi Talam and its various forms

Definitions and recitation of different gathis

### UNIT 3

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

### UNIT 4

Learning of Jathi Formation

Basic jathis

Jathis for Dance forms

Some Basic Definitions of Korvai, Teermanam etc.,

#### Reference Books:

1. Mridangam- An Indian Classical Percussion Drum – Shreejyanthi 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>B19SM2080</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>

#### Prerequisites:

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

#### Course Objectives:

The objectives of this course are to:

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:

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

1. Acquire proficiency in using *Scilab* to find identity and inverse element of a group and in construction of Caley –Table.

- Demonstrate the use of *Maxima* to understand and interpret the various types of functions from the algebraic and graphical points of view.
- Sketch graphs of standard curves using *Maxima* to interpret tracing of curves.
- 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
B19SM2080	CO1	3	2	2				1	1	3	3
	CO2	3	2	2	1			1	1	3	3
	CO3	2	2	2	1			1	1	3	3
	CO4	3	2	2				1	1	3	3

### Lab Experiments

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

### Text Books:

- SCILAB: A Practical Introduction to Programming and Problem Solving [Print Replica] Kindle Edition by Tejas Sheth (Author).
- The Maxima Book Paulo Ney de Souza Richard J. Fateman Joel Moses Cliff Yapp 19th September 2004.

B19SM2090	Basic Statistics Lab-II	L	T	P	C
Duration:14 Wks		0	0	2	2

### Prerequisites:

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

### Course Objectives:

The objectives of this course are to:

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

**Course Outcomes:**

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

1. Describe the univariate and bivariate random variables using probability.
2. Identify the various distributions (changed the added co-2 mapping)
3. Analyze the probability distributions.
4. Investigate the applications of limit theorems.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM2090</b>	<b>CO1</b>	2	3	2	3	1	2	1	1	3	2
	<b>CO2</b>	2	2	1	1	1	1	1	1	2	1
	<b>CO3</b>	3	3	2	3	1	2	1	1	3	3
	<b>CO4</b>	2	3	2	2	1	2	1	1	3	3

**Lab Experiments**

**(Demonstration using MS Excel and R software)**

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

**Text books:**

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

6. S.C Gupta and V.K Kapoor, Fundamentals of Mathematical Statistics, 11th Edn., (Reprint), Sultan Chand and Sons, 2007.
7. Miller, Irwin and Miller, Marylees, John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia, 2006.
8. Gupta S.C and Kapoor V.K: (2006). Fundamental Mathematical Statistics, Sultan Chand and Sons 88, Daryaganj, New Delhi.
9. Spiegel, M.R. (2001). *Probability and Statistics*, 4/e, Schaum's Outline Series, McGraw Hill, London.
10. Hogg, R. V. and Craig, A.T. (1995). *Introduction to Mathematical Statistics*, 5/e, Prentice Hall, New Jersey, USA.
11. Medhi, J. (1992). *Statistical Methods: An introductory text*, New Age International, New Delhi.
12. Goon A.M., Gupta, M.K., Das Gupta, B. (1991). *Fundamentals of Statistics*, Vol.I, World Press, Calcutta

**Reference Books:**

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

<b>B19SM2X10</b>	<b>Data Structures Lab</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:**

Computer Programming 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 completion of this course the student will 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	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM2X10</b>	<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>
	<b>CO3</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>CO4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>					<b>3</b>	<b>2</b>

#### **LabExperiments**

##### **PART – A**

1. Write a menu driven C program to perform the following string operations without using string functions: (i) String Length (ii) String Concatenation
2. Write a C program to search for an element in an array using Binary search
3. Write a C program to sort a list of N elements using Bubble Sort Algorithm
4. Write a C program to demonstrate the working of stack using an array.
5. Write a C program for Towers of Hanoi problem.
6. Write a C program to find GCD of two numbers using recursion
7. Write a C program to demonstrate the working of Queue using an array.
8. Write a C program to simulate the working of Circular Queue using an array.
9. Write a C program to construct a singly linked list and perform following operations  
a. Inserting a node b. deleting the node c. searching a node d. displaying all the nodes
10. Write a C program to demonstrate binary tree traversal.

##### **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).

#### **Reference Books :**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
3. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
4. Seymour Lipschutz, Data Structures, Schaum's Outlines Series, Tata McGraw-Hill.
5. Ellis Horowitz, Satraj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, W. H. Freeman and Company. 6. R. G. Dromey, How to Solve it by Computer, Prentice-Hall of India

### Semester: III

<b>B19SM3011</b>	<b>Language:Kannada</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:

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

### Course Objectives:

The objectives of this course are to:

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

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

### Course Outcomes:

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

ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯ ಪ್ರಕಾರಗಳಾದ ನವೋದಯ, ನವ್ಯಕಾವ್ಯ, ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟ ಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

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

### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM3011</b>	<b>CO1</b>					<b>2</b>	<b>3</b>				

	CO2					2	3				
	CO3						3				
	CO4							3	2		

## Course Contents:

### Unit I ನವೋದಯ ಕವಿತೆಗಳು

[12 Hours]

- |                  |                  |
|------------------|------------------|
| 1. ಮುದಿಯರಾಮಗೌಡ   | ಬಿ. ಎಂ. ಶ್ರೀ     |
| 2. ಬೆಳಗು         | ದ.ರಾ. ಬೇಂದ್ರೆ    |
| 3. ಕಲ್ಪಿ         | ಕುವೆಂಪು          |
| 4. ಕನ್ನಡ್ ಪದಗೋಳ್ | ಜಿ. ಪಿ. ರಾಜರತ್ನಂ |

### Unit II ನವೋದಯ ಹಾಗೂ ನವ್ಯ ಕವಿತೆಗಳು

[12 Hours]

- |                  |                |
|------------------|----------------|
| 1. ಅವಧೂತ         | ಸು.ರಂ.ಎಕ್ಕುಂಡಿ |
| 2. ಮನೆಯಿಂದ ಮನೆಗೆ | ಕೆ.ಎಸ್.ನ       |
| 3. ನನ್ನ ಹಣತೆ     | ಜಿ.ಎಸ್.ಎಸ್.    |
| 4. ನಂಬಿಕೆ        | ಚನ್ನವೀರಕಣವಿ    |

### Unit III ಸಣ್ಣ ಕಥೆಗಳು

[12 Hours]

- |                         |               |
|-------------------------|---------------|
| 1. ಮುದ್ದಣ ಮನೋರಮೆ ಸಲ್ಲಾಪ | ಮುದ್ದಣ        |
| 2. ದಾಳಿ ನಡೆದಾವಅಣ್ಣಾ     | ಅಮರೇಶ ನುಗಡೋಣಿ |
| 3. ಕೊನೆಯಗಿರಾಕಿ          | ನಿರಂಜನ        |
| 4. ಮಾನೀಟರ್              | ತೇಜಸ್ವಿ       |

### Unit IV ನಾಟಕ

[12 Hours]

ಮೀಡಿಯಾ ಅನುವಾದ.: ಕೆ. ಮರುಳ ಸಿದ್ದಪ್ಪ

## Suggested Text Books and References:

1. ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರುಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸೀಮಾತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
3. ಡಾ. ಅರವಿಂದ ಮಾಲಗತ್ತಿ, ಸಾಹಿತ್ಯ ಸಂಸ್ಕೃತಿ ಮತ್ತುದಲಿತ ಪ್ರಜ್ಞೆ, ಪ್ರಕಾಶಕರುಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2014
4. ಡಾ. ಈ.ಎಸ್. ಆಮೂರ, ಕನ್ನಡಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
5. ಕೀರ್ತನಾಧಿಕುರ್ತುಕೋಟೆ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರುಕುರ್ತುಕೋಟೆ ಮೆಮೋರಿಯಲ್‌ಟ್ರಸ್ಟ್, ಧಾರವಾಡ. 2009
6. ಸಂ. ಬಿ.ಎಸ್. ಕೇಶವರಾವ್. ಕೈಲಾಸಂ ಕನ್ನಡ ನಾಟಕಗಳು, ಪ್ರಕಾಶಕರುಅಂಕಿತ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2005
7. ಶಾಮರಾಯತ.ನು., ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು -2014
8. ಆಧುನಿಕಕನ್ನಡಕಾವ್ಯ ಭಾಗ-2, ಕುವೆಂಪು ಕನ್ನಡಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2004
9. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

<b>B19SM3012</b>	<b>Language – II: Hindi</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:**

- अध्येताको, हिन्दीनाटकसाहित्यकासंक्षिप्तज्ञानआवश्यकहै।
- हिन्दीसाहित्यकेइतिहासकासंक्षिप्तज्ञानकीआवश्यकताहै।
- हिन्दीव्याकरणकाअवबोधनआवश्यकहै।
- मीडियालेखनकीबुनियादीजानकारीचाहिए।
- अंग्रेज़ी-हिन्दीअनुवादसेसंबंधितजानकारीजरूरीहै।

**Course Objectives:**

The objectives of this course are to:

1. संदर्भानुसारउचितभाषाकाप्रयोगकरनेकीदक्षताकोछात्रोंमेंउत्पन्नकरना।
2. साहित्यकेमाध्यमसेसमाजएवंमानवीयमूल्योंकोसमझाकर, उनमूल्योंकीरक्षाहेतुप्रेरितकरना।
3. छात्रोंमेंपुस्तकपठनएवंलेखनकीअकृतिमप्रवृत्तिस्थापितकरना।
4. अध्येताओंमेंसाहित्यकेमाध्यमसेप्रभावीएवंकुशलसंचारकाविकासकरना।

**Course Outcomes:**

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

1. सामाजिकमूल्यएवंनैतिकजवाबदेहीकोस्वीकारकरसकताहै।
2. साहित्यकीप्रासंगिकताकोजीवनमेंसमझनेकीदक्षतारखताहै।
3. समाजमेंअंतर्निहितपद्धतियाँएवंविचारधाराओंकाव्याख्यानकरनेमेंसक्षमबनसकताहै।
4. साहित्यकेमाध्यमसेप्रभावीएवंकुशलसंचारकाविकासकरसकताहै।

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM3012</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>			
	<b>CO3</b>					<b>3</b>	<b>3</b>	<b>3</b>			
	<b>CO4</b>					<b>3</b>	<b>2</b>	<b>3</b>			

**Course Contents:**

**इकाई-1:** नाटक: एक और द्रोणाचार्य- डॉ. शंकरशेष

**[12 Hrs]**

लेखकपरिचय  
प्रथमदृश्य  
द्वितीयदृश्य

**इकाई-2:** नाटक: एक और द्रोणाचार्य  
तृतीयदृश्य  
चतुर्थदृश्य

[12 Hrs]

**इकाई-3:** नाटक: और द्रोणाचार्य एक  
पंचमदृश्य  
छठादृश्य

[12 Hrs]

**इकाई-4:** अनुवाद, जनसंचारमाध्यम  
**अनुवाद :** अंग्रेजी - हिन्दी ( समाचारपत्रसे संबंधित )  
**जनसंचारमाध्यम :** स्वरूप, उद्भव और विकास ।

[12 Hrs]

**सन्दर्भग्रन्थ :**

1. एक और द्रोणाचार्य-डॉ. शंकरशेष
2. मीडियालेखन एवं जनसंचार-डॉ. संजीवकुमार
3. हिन्दीसाहित्यका इतिहास - डॉ. नागेन्द्र
4. आधुनिक हिन्दीसाहित्यका इतिहास - डॉ. बच्चनसिंह
5. हिन्दीसाहित्यकानवीन इतिहास - डॉ. लालसाहबसिंह
6. शुद्ध हिन्दी कैसे बोले कैसे लिखे- पृथ्वीनाथपाण्डे
7. कार्यालय अनुवाद निदेशिका
8. मीडियाविमर्श-रामशरणजोशी
9. संस्कृति, जनसंचार और बाजार-नन्दभरद्वज

<b>B19SM3013</b>	<b>Language-II: Additional English</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 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:

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

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
B19SM3013	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

### Course Contents:

#### UNIT-I: Gender & Identity

[12Hrs]

Anne Sexton – Consorting with Angels; Eugene Field – The Doll’s Wooing; Suniti Namjoshi – Extracts from *Feminist Fables*; Ruth Vanita & Saleem Kidwai (ed) – *Same Sex Love in India* (Extract); Charlotte Perkins Gilman – The Yellow Wallpaper

#### UNIT-II: Love & Romance

[12Hrs]

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-III: War & Trauma

[12Hrs]

Lord Alfred Tennyson – The Charge of the Light Brigade; Taufiq Rafat – The Medal; Guy de Maupassant – Two Friends; Sadaat Hasan Manto – Toba Tek Singh; Bertolt Brecht – Excerpt from *Fear and Misery of the Third Reich*

#### UNIT-IV: Children’s Literature

[12Hrs]

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)

**Reference Books:**

1. Sexton, Anne. *The Complete Poems*. Houghton Mifflin, 1999.
2. Namjoshi, Suniti. *Feminist Fables*. Spinifex Press, 1998.
3. Vanita, Ruth & Saleem Kidwai (ed.) *Same Sex Love in India*. Penguin India, 2008.
4. Gilman, Charlotte Perkins. *The Yellow Wallpaper*. Rockland Press, 2017.
5. Gale, Cengage Learning. *A Study Guide for Alfred Noyes's "The Highwayman"*. Gale, Study Guides, 2017. (Kindle Edition Available)
6. Shakespeare, William. *Poems and Sonnets of William Shakespeare*. Cosimo Classics, 2007.
7. Stockton, Frank Richard. *The Lady, or the Tiger?* Create space Independent Publications, 2017.
8. Wilde, Oscar. *The Collected Works of Oscar Wilde*. Wordsworth Editions Ltd., 1997.
9. Shakespeare, William. *Romeo and Juliet*. Rupa, 2001.
10. Tennyson, Lord Alfred. *The Complete Works of Alfred Tennyson*. Forgotten Books, 2017.
11. Owen, Wilfred. *The Poems of Wilfred Owen*. Wordsworth Editions Ltd., 1994.
12. Maupassant, Guy de. *Guy de Maupassant-The Complete Short Stories*. Projapati, 2015.
13. Manto, Sadaat Hasan. *Manto: Selected Short Stories*. RHI, 2012.
14. Brecht, Bertolt. *Fear and Misery in the Third Reich*. Methuen Drama, 2012.
15. Ricks, Christopher. *Metaphysical Poetry*. Penguin, 2006.
16. Anderson, Hans Christian. *Fairy Tales by Hans Christian Anderson*. Read Books, 2010.
17. Sewell, Anna. *The Black Beauty*. Maple Press, 2014.
18. Kipling, Rudyard. *The Jungle Book*. Amazing Reads, 2018.

<b>B19SM3020</b>	<b>Communicative 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:**

The objectives of this course are to:

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 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/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM3020	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

### Course Contents:

**UNIT – I:** [12Hrs]  
**Remedial Grammar:** Past Simple; Past Continuous; Irregular Verbs; **Writing Skills:** Paragraph Writing; **Activities:** Conversations; Leaving Phone Messages **Literature:** Chief Seattle – The End of Leaving and Beginning of Survival

**UNIT – II:** [12Hrs]  
**Remedial Grammar:** Present Simple & Present Continuous; Activity & State Verbs; **Writing Skills:** Official Letters; **Activities:** Making Apologies; Invitations & Making Arrangements; **Literature:** Ruskin Bond – Tiger in the Tunnel

**UNIT – III:** [12Hrs]  
**Remedial Grammar:** Present Perfect; For, Since & How Long; -ed& -ing adjectives; Prefix & Opposites of Adjectives; **Writing Skills:** Note Making; **Activities:** Agreeing & Disagreeing with Opinions; **Literature:** Jesse Owens - My Greatest Olympic Prize.

**UNIT – IV:** [12Hrs]  
**Remedial Grammar:** Collocations; Prepositions; **Writing Skills:** Precis Writing; **Activities:** Offers, Suggestions & Requests; **Literature:** Avijit Pathak – Onscreen Magic

### Reference Books:



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

<b>B19SM3030</b>	<b>Mathematics-III</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:**

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

**Course Objectives:**

The objectives of this course are to:

1. Develop the knowledge about the subgroups and group homomorphisms.
2. Familiarize with the concept of higher order ordinary differential equations.
3. Understand the concept of Laplace transform.
4. Familiarize with Inverse Laplace transforms.

**Course Outcomes:**

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

1. Classify and generate subgroups and normal subgroups.
2. Solve higher order linear differential equations.
3. Apply the knowledge of Laplace transform.
4. Discuss inverse Laplace transforms.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM3030</b>	<b>CO1</b>	<b>3</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>3</b>	<b>3</b>			<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>
	<b>CO3</b>	<b>3</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>2</b>			<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>

**Course Content:**

**Unit-I: Group Theory-2****[12 Hrs]**

Subgroups-Theorems on subgroups (**with proof**), problems Normal subgroups, Homomorphism, Isomorphism, Left and Right cosets, The kernel of a homomorphism.

**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, Cauchy-Euler equation, System of linear differential equations, Solution of a system of linear equations with constant coefficients.

**Unit-III: Laplace Transforms****[12 Hrs]**

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

**Unit-IV: Inverse Laplace Transforms****[12 Hrs]**

Inverse Laplace transforms, Properties of inverse Laplace transform, Solution of differential equations using Laplace transforms, Convolution theorem, Solution of differential equations 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 eastern.
- 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 Manicavachogam Pillay, 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).

<b>B19SM3040</b>	<b>Statistical Inference-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 basics statistics-I & II, basics mathematics, differentiation, and integration.

**Course Objectives:**

The objectives of this course are:

1. Characterize the sampling distributions.
2. Classify the different techniques of point estimation for estimating the parameter values.
3. Describe the interval estimation and simulation.

**Course Outcomes:**

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

1. Define the sampling distributions.
2. Differentiate the different techniques of point estimation for estimating the parameter values.
3. Analyse the various point estimators. (changed the added co-3 mapping)
4. Compare the parameters of interval estimation and simulation.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM3040	CO1	2	2	2	2	1	1	1	1	2	2
	CO2	2	3	3	3	1	2	1	1	3	3
	CO3	2	2	1	2	1	1	1	1	2	2
	CO4	2	3	3	2	1	2	1	1	3	2

**Course Content:**

**Unit-1: Sampling distributions [12 Hrs]**

Definitions of random sample, parameter and statistic, sampling distribution of a statistic, sampling distribution of sample mean and variance, standard errors of sample mean, sample variance and sample proportion, Chi-square, t, and F distributions-mean, variance, M.G.F, and properties, relation among t, F and chi-square distributions.

**Unit-2: Point estimation-I [12 Hrs]**

Families of distributions-location and scale families, single parameter exponential family, point estimation, concepts of estimator and estimate, criteria for estimators: unbiasedness, consistency, invariance property of consistent estimators, efficiency and relative efficiency, mean square error as a criterion for comparing estimators.

**Unit-3: Point estimation-II [12 Hrs]**

Sufficient statistic, statement of Neyman-Factorization theorem, Fisher information function, statement of Cramer-Rao inequality and its applications, minimum variance unbiased estimator and minimum bound estimator.

**Methods of point estimation:** Maximum likelihood and method of moment estimation, properties of maximum likelihood and moment estimators and examples.

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

**Interval estimation:** Confidence interval, confidence coefficient, shortest confidence interval, method of constructing confidence intervals using pivotal quantity, construction of confidence

intervals for mean, difference of two means, variance and ratio of variances, proportion, difference of two proportions, and correlation coefficient.

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

**Text books:**

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

**Reference Books:**

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

<b>B19SM3050</b>	<b>RDBMS</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:**

**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:

After the completion of the course, the student will be able:

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
B19SM3050	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				3	2	3

## Course Content:

### 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 an 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.

**Text Book:**

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>B19SM3060</b>	<b>Classical Optimization</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:**

Knowledge of function, continuous function differentiable function and differential calculus.

**Course Objectives:**

The objectives of this course are to:

5. Make students to learn principles of optimization.
6. Implement the optimization concepts for the structural engineering problems.
7. Evaluate different methods of optimization.
8. Understand use of Structured Query Language (SQL) and learn SQL syntax.

**Course Outcomes:**

After the completion of the course, the student will be able:

1. Achieve Knowledge of design and development of problem solving skills.
2. Understand the principles of optimization and the concept of Dynamic programming.
3. Design and develop analytical skills.
4. Summarize the Linear, Non-linear and Geometric Programming.

**Mapping of Course Outcomes with programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM3060</b>	<b>CO1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>					<b>2</b>	<b>3</b>
	<b>CO2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>					<b>3</b>	<b>2</b>

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

**Course Content:**

**UNIT-I:** [12 Hrs]

Introduction to optimization, Engineering applications of optimization, Formulation of structural optimization problems as programming problems. Optimization Techniques: Classical optimization techniques, Single variable optimization, Multivariable optimization with no constraints.

**UNIT-II:** [12 Hrs]

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

**UNIT-III:** [12 Hrs]

Non-linear programming, One dimensional minimization methods, Elimination methods, Fibonacci method, Golden section method, Interpolation methods, Quadratic and cubic methods, Unconstrained optimization methods, Direct search methods, Random search methods, Descent methods.

**UNIT-IV:** [12 Hrs]

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

**Reference Books:**

1. Spunt, "Optimum Structural Design"- Prentice Hall
2. S.S. Rao, "Optimization – Theory and Practice"- Wiley Eastern Ltd.
3. Uri Krisch, "Optimum Structural Design"- McGraw Hill
4. Richard Bronson, "Operation Research"- Schaum's Outline Series
5. Bhavikatti S.S.- "Structural optimization using sequential linear programming"- Vikas publishing house

<b>B19SM3070</b>	<b>Mathematics 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:**

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

**Course Objectives:**

The objectives of this course are to:

1. Understand normal subgroups using *Maxima* .
2. Solve higher order linear differential equations using *Maxima*.

3. Apply the knowledge of Laplace transform using *Maxima* .
4. Discuss inverse Laplace transforms using *Maxima*.

### Course Outcomes:

After the completion of the course, the student will be able:

1. Acquire knowledge in using *Maxima* to verify a normal subgroup, homomorphism of a group and isomorphism of a group.
2. Acquire proficiency in using *Maxima* to study differential calculus.
3. Demonstrate the use of *Maxima* to understand and interpret the concepts in Laplace transform.
4. Exhibit the fundamentals of inverse Laplace transform using *Maxima*.

### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM3070	CO1	3	2	2	1			1	1	3	2
	CO2	3	2	2	1			1	1	3	3
	CO3	3	2	2	1			1	1	3	2
	CO4	3	2	2	1			1	1	2	3

### Course Contents:

1. To verify whether a given subgroup is a normal subgroup or not.
2. To verify whether a given function is a homomorphism or not.
3. To verify a given onto homomorphism of a group is isomorphism or not.
4. To verify Lagrange's theorem.
5. To find left and right cosets (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.

### Text Books:

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>B19SM3080</b>	<b>Statistical Inference 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>

### Prerequisites:



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

**Course Objectives:**

The objectives of this course are:

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

**Course Outcomes:**

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

1. Define the sampling distributions.
2. Differentiate the different techniques of point estimation for estimating the parameter values.
3. Analyse the various point estimators. (changed the added co-3 mapping)
4. Compare the parameters of interval estimation and simulation.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM3080	CO1	2	2	2	2	1	1	1	1	2	2
	CO2	2	3	3	3	1	2	1	1	3	3
	CO3	2	2	1	2	1	1	1	1	2	2
	CO4	2	3	3	2	1	2	1	1	3	2

**LabExperiments**

(Demonstration using MS Excel and R Software)

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

**Text books:**

1. Walpole, R E., Myers, R H, and Myers, S L (2017). *Probability and Statistics for Engineers and Scientists*, 9/e, Pearson, New Delhi.
2. Mukhopadhyay, P (2015): *Mathematical Statistics*, Books and Allied (P) Ltd., Kolkata.
3. Montgomery, D C and Runger, G C (2013). *Applied Statistics and Probability for Engineers*, WileyIndia, New Delhi.
4. Spiegel, M R (2001). *Probability and Statistics*, 4/e, Schaum's Outline Series, McGraw Hill, London.
5. Hogg, R V and Craig, AT (1995). *Introduction to Mathematical Statistics*, 5/e, Prentice Hall, New Jersey, USA.
6. Medhi, J (1992). *Statistical Methods: An introductory text*, New Age International, New Delhi.
7. Goon A M, Gupta, M K, Das Gupta, B (1991). *Fundamentals of Statistics*, Vol.I, World Press, Calcutta.

**Reference Books:**

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

<b>B19SM3090</b>	<b>RDBMS Practical - 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:**

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.
3. To understand various queries and their execution.
4. To design new database and modify existing ones for new applications and reason about the efficiency of the result.

**Course Outcomes:**

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

1. Infer database language commands to create simple database
2. Analyze the database using queries to retrieve records
3. Analyze front end tools to design forms, reports and menus
4. Develop solutions using database concepts for real time requirements.

### Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM3090</b>	<b>CO1</b>	<b>3</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>1</b>	<b>2</b>	<b>2</b>
	<b>CO3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>			<b>1</b>	<b>3</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>	<b>3</b>

### Lab Experiments

#### PART – A

1. The STUDENT detail databases have 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)  
 CATLOG(book-id: int, title:string,author-id:int, publisher-id:int, category:int, year:int, price: int)  
 CATEGORY(category-id: int, description: string)  
 ORDER-DETAILS(order-no: int, book-id: int, quantity: int)

- i) Create above tables by properly specifying the primary keys and the foreign keys.
- ii) Enter atleast five tuples for each relation.
- iii) Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2010.
- iv) Find the author of the book which has maximum sales.
- v) Demonstrate how to increase price of books published by specific publisher by 10%

7. Consider the following database for BANK.

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

ACCOUNT(accno: int, branch-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 PROCESING.

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 Raghuram Krishnan, Johannes Gehrke, McGraw Hill Publication.
3. “Fundamentals of Database Systems” by Elmasri, Navathe, 5th Edition, Pearson Education (2008).

## Semester: IV

<b>B19SM4011</b>	<b>Language-II: Kannada</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:

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

## Course Objectives:

The objectives of this course are to:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ನಾಲ್ಕನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯ ಪ್ರಕಾರಗಳಾದ ನವ್ಯ, ಸ್ತ್ರೀವಾದಿ ಹಾಗೂ ನವೋದ್ಧಾರಕಾವ್ಯ, ವಿವಿಧ ಲೇಖನಗಳು ಹಾಗೂ ಕಾದಂಬರಿ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

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

## Course Outcomes:

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

ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯ ಪ್ರಕಾರಗಳಾದ ನವ್ಯ-ನವೋದ್ಧಾರಕಾವ್ಯ, ವಿವಿಧ ಲೇಖನಗಳು ಹಾಗೂ ಕಾದಂಬರಿ ಸಾಹಿತ್ಯಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟ ಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

1. ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
2. ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.

3. ಸಾಮಾಜಿಕಅರಿವು ಮೂಡಿಸುತ್ತದೆ.
4. ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.

### Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM4011</b>	<b>CO1</b>					<b>2</b>	<b>3</b>				
	<b>CO2</b>					<b>2</b>	<b>3</b>				
	<b>CO3</b>						<b>3</b>				
	<b>CO4</b>							<b>3</b>	<b>2</b>		

#### Course Contents:

##### Unit Iನವ್ಯ-ಸ್ತ್ರೀವಾದಿ ಕವಿತೆಗಳು

[12 Hours]

- |                               |                   |
|-------------------------------|-------------------|
| 1. ಕಟ್ಟುವೆವು ನಾವು             | ಗೋಪಾಲಕೃಷ್ಣ ಅಡಿಗರು |
| 2. ಬುದ್ಧಿವಂತರಿಗೆ ಕನಸು ಬಿದ್ದರೆ | ಎ.ಕೆ.ರಾಮನುಜನ್     |
| 3. ಕುರಿಗಳು ಸಾರ್ ಕುರಿಗಳು       | ನಿಸಾರ್ ಅಹಮದ್      |
| 4. ಅಕ್ಕ ಹೇಳಿದು                | ಸ. ಉಷಾ            |

##### Unit IIದಲಿತ-ಬಂಡಾಯ

[12 Hours]

- |                                  |                   |
|----------------------------------|-------------------|
| 1. ನನ್ನ ಕವನಗಳಲ್ಲಿ ಹುಡುಕದಿರು ನನ್ನ | ಚಂಪಾ              |
| 2. ಜನಪದ ಕಥೆಗಳ ರಾಕ್ಷಸ             | ಚಂದ್ರಶೇಖರಕಂಬಾರ    |
| 3. ದಲಿತರು ಬರುವುದಾರಿಬಿಡಿ          | ದ್ವಲಿಂಗಯ್ಯ        |
| 4. ಕಟ್ಟಡದ ಕೆಲಸಗಾರರು              | ಎಚ್.ಎಸ್ ಶಿವಪ್ರಕಾಶ |

##### Unit IIIಲೇಖನಗಳು

[12 Hours]

- |   |               |
|---|---------------|
| 1. ಹಸಿರು ಹೊಸಕುವ ಗಣಿಗಳು                        | ಯಲ್ಲಪ್ಪರೆಡ್ಡಿ |
| 2. ವಚನಕಾರರ ವಿಚಾರ ಕ್ರಾಂತಿ                      | ಜಿ.ಎಸ್.ಎಸ್    |
| 3. ಜಾಗತೀಕರಣದ ಹಿನ್ನೆಲೆಯಲ್ಲಿಗಾಂಧೀಜಿಯ ಪ್ರಸ್ತುತತೆ | ಸಿ. ನಾಗಣ್ಣ    |
| 4. ಚಾರ್ವಾಕರು :ಒಂದುಟಿಪ್ಪಣಿ                     | ಪಿ ಎನ್‌ರಂಗನ್  |

##### Unit IVಕಾದಂಬರಿ

[12 Hours]

- |            |                    |
|------------|--------------------|
| 1. ಸಂಸ್ಕಾರ | ಯು.ಆರ್. ಅನಂತಮೂರ್ತಿ |
|------------|--------------------|

#### ಪಠ್ಯಪುಸ್ತಕ ಗ್ರಂಥಗಳು :

1. ಮುಗಳಿ ರಂಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರುಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸೀಮಾತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
3. ಹಂಪ ನಾಗರಾಜಯ್ಯ, ಸಾಂಗತ್ಯ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
4. ರಂಜಾನ್‌ದರ್ಗಾ, ಶರಣರ ಸಮಗ್ರಕ್ರಾಂತಿ, ಪ್ರಕಾಶಕರು. ಲೋಹಿಯಾ ಪ್ರಕಾಶನ, ಬಳ್ಳಾರಿ. 2015

5. ವಸಿಷ್ಠ, ರತ್ನಾಕರವರ್ಣಿಯ ಭರತೇಶ ವೈಭವ, ಪ್ರಕಾಶಕರುಚೇತನ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 1999
6. ಡಾ. ಅರವಿಂದ ಮಾಲಗತ್ತಿ, ಸಾಹಿತ್ಯ ಸಂಸ್ಕೃತಿ ಮತ್ತುದಲಿತ ಪ್ರಜ್ಞೆ, ಪ್ರಕಾಶಕರುಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2014
7. ಡಾ. ಈ.ಎಸ್. ಅಮೂರ, ಕನ್ನಡಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
8. ಕೀರ್ತನಾಧಿಕುರ್ತುಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರುಕುರ್ತುಕೋಟಿ ಮೆಮೋರಿಯಲ್‌ಟ್ರಸ್ಟ್, ಧಾರವಾಡ. 2009
9. ಶಾಮರಾಯತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣಯ್ಯ ಸ್ಮಾರಕಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು -2014
10. ಸಂ. ಡಾ! ಸಿ. ಆರ್. ಚಂದ್ರಶೇಖರ್, ಮುಂದಾಳುತನದ ಲಕ್ಷಣಗಳನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವುದು ಹೇಗೆ?, ಪ್ರಕಾಶಕರು ನವಕರ್ನಾಟಕ ಪಬ್ಲಿಕೇಷನ್ಸ್ ಪ್ರೈವೇಟ್ ಲಿಮಿಟೆಡ್. 2010
11. ಆಧುನಿಕಕನ್ನಡಕಾವ್ಯ ಭಾಗ-2, ಕುವೆಂಪು ಕನ್ನಡಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2004
12. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

<b>B19SM4012</b>	<b>Language – II: Hindi</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:

- ಅध्येताको, हिन्दीखंडकाव्यकासंक्षिप्तज्ञानआवश्यकहै।
- हिन्दीसाहित्यकेइतिहासकासंक्षिप्तज्ञानकीआवश्यकताहै।
- हिन्दीव्याकरणकाअवबोधनआवश्यकहै।

### Course Objectives:

The objectives of this course are to:

1. संदर्भानुसारउचितभाषाकाप्रयोगकरनेकीदक्षताकोछात्रोंमेंउत्पन्नकरना।
2. साहित्यकेमाध्यमसेसमाजएवंमानवीयमूल्योंकोसमझाकर, उनमूल्योंकीरक्षाहेतुप्रेरितकरना।
3. छात्रोंमेंपुस्तकपठनएवंलेखनकीअकृतिमप्रवृत्तिस्थापितकरना।
4. अध्येताओंमेंसाहित्यकेमाध्यमसेप्रभावीएवंकुशलसंचारकाविकासकरना।

### Course Outcomes:

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

अध्ययनकीसमाप्तिपरअध्येता-

1. सामाजिकमूल्यएवंनैतिकजवाबदेहीकोस्वीकारकरसकताहै।
2. साहित्यकीप्रासंगिकताकोजीवनमेंसमझनेकीदक्षतारखताहै।
3. समाजमेंअंतर्निहितपद्धतियाँएवंविचारधाराओंकाव्याख्यानकरनेमेंसक्षमबनसकताहै।
4. साहित्यकेमाध्यमसेप्रभावीएवंकुशलसंचारकाविकासकरसकताहै।

### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM4012</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:**

**इकाई-1:** खंडकाव्य-संशयकीरात – नरेशमेहता [12 Hrs]  
 कविपरिचय  
 प्रथमसर्ग  
 द्वितीयसर्ग

**इकाई-2:** खंडकाव्य-संशयकीरात [12 Hrs]  
 तृतीयसर्ग  
 चतुर्थसर्ग

**इकाई-3:** खंडकाव्य-संशयकीरात [12 Hrs]  
 पंचमसर्ग  
 छठासर्ग  
 सप्तमसर्ग

**इकाई-4:** व्याकरण : अलंकार, सिनिमारिव्यू [12 Hrs]  
 व्याकरण : अलंकार  
 सिनिमारिव्यू :  
 दंगल, सत्याग्रह , हिन्दीमीडियम और चेक दे इंडिया ।

**सन्दर्भग्रन्थ :**

1. संशयकीएकरात-नरेशमेहता
2. हिन्दीसाहित्यकाइतिहास - डॉ. नागेन्द्र
3. आधुनिकहिन्दीसाहित्यकाइतिहास - डॉ. बच्चनसिंह
4. हिन्दीसाहित्यकानवीनइतिहास - डॉ. लालसाहबसिंह
5. शुद्धहिन्दीकैसेबोलेकैसेलिखे- पृथ्वीनाथपाण्डे
6. भारतीयसंस्कृतिकेआधार - विद्यानिवासमिश्रा
7. रामायणकीकहानियाँ - हर्षाशर्मा
8. रसछंदऔरअलंकार - कृष्णदेवशर्माऔरसुरेशअग्रवाल

<b>B19SM4013</b>	<b>Language-II: Additional English</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 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:**

On completion of the course, learners will be able to

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>B19SM4013</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>B19SM4020</b>	<b>Communicative 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 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:**

After the completion of the course, students 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
B19SM4020	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

#### Course Contents:

**UNIT – I** **[12 Hrs]**  
**Remedial Grammar:** Questions & Negatives; Questions Tags; **Writing Skills:** Email Writing;  
**Activities:** Group Discussions; **Literature:** Alphonse Daudet - The Last Lesson

**UNIT – II** **[12 Hrs]**  
**Remedial Grammar:** Past Simple & Past Perfect; **Writing Skills:** Report Writing; **Activities:**  
 Book & Movie Reviews; **Literature:** Lord Alfred Tennyson – Ulysses

**UNIT – III** **[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** **[12 Hrs]**  
**Remedial Grammar:** Reported Speech; Idioms; **Writing Skills:** Cover Letter & CV; **Activities:**  
 Exchanging Information; **Literature:** Saki – The Open Window

#### Reference Books:

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

<b>B19SM4030</b>	<b>Mathematics-IV</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:**

Differentiation, integration, basic concepts of arithmetic and algebra.

**Course Objectives:**

The objectives of this course are:

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:**

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

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

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM4030</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 a 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 convergent 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's 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 KMittal, Differential Calculus, Reprint. New Delhi: S.Chand & Company Ltd., 2011.
- 2) G K Ranganath, Text book 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>B19SM4040</b>	<b>Statistical Inference-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 basics statistics-I & II, basics mathematics, differentiation, integration and basics statistical inference-I.

**Course Objectives:**

The objectives of this course are:

1. To allocate and explore the tests of hypotheses for the experimental data.

2. To classify and infer the various tests of significance.
3. To figure out the different nonparametric tests.

### Course Outcomes

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

1. Infer the experimental data analysis using the tests of hypotheses.
2. Discriminate the various applications of tests of significance.
3. Analyse the problems using various tests of significance. (changed the added co-3 mapping)
4. Investigate the data using nonparametric tests.

### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM4040</b>	CO1	2	3	2	2	1	2	1	1	3	2
	CO2	2	2	2	2	1	2	1	1	2	2
	CO3	2	2	1	1	1	1	1	1	2	2
	CO4	2	3	2	2	1	2	1	1	2	2

### Course Content:

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

Statistical hypotheses-null and alternative, simple and composite hypotheses. Type-I and Type- II errors, test functions, randomized and nonrandomized tests, size, level of significance, power function, power of tests, critical region, p-value and its interpretation, illustrative examples. Most powerful (MP) test, statement of Neyman-Pearson lemma and its applications.

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

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

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

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

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

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

### Text books:

1. Walpole, R E, Myers, R H, and Myers, S L (2017). *Probability and Statistics for Engineers and Scientists*, 9/e, Pearson, New Delhi.
2. Mukhopadhyay, P (2015): *Mathematical Statistics*, Books and Allied (P) Ltd., Kolkata.
3. Montgomery, D C and Runger, G C (2013). *Applied Statistics and Probability for Engineers*, Wiley India, New Delhi.
4. Chandra, T K and Chatterjee, D (2005). *A First Course in Probability*, Narosa Publishing House, New Delhi.
5. Lehmann, E L and Romano, J P (2005), *Testing Statistical Hypotheses*, 2/e, John Wiley, New York.
6. Hogg, R V and Craig, A T (1995). *Introduction to Mathematical Statistics*, 5/e, Prentice Hall, New Jersey, USA.

**Reference Books:**

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

<b>B19SM4050</b>	<b>Operating Systems &amp; Shell Programming Using LINUX</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:**

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:**

After the completion of the 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 create 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
B19SM4050	CO1	3	3	3				1	2	3	3
	CO2	3	3	2	2				2	3	1
	CO3	3	2	2	1			1	1	3	2
	CO4	3	2	2	2			2	2	3	2

#### Course Content:

##### 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 re-locatable 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>B19SM4060</b>	<b>Soft Skill Training</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>B19SM4070</b>	<b>Mathematics 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:**

Differentiation, integration, basic concepts of arithmetic and algebra.

**Course Objectives:**

The objectives of this course are to:

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:**

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

1. Exhibit proficiency in using Maxima to study differential calculus.
2. Obtain knowledge in differential calculus
3. Sketch the graph for solutions.

4. 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
B19SM4070	CO1	3	2	2	1	1	1		1	3	2
	CO2	3	2	2	1	1			1	3	3
	CO3	3	2	2	1	1			1	3	2
	CO4	3	2	2	1			1	1	2	2

### Course Content:

- To verify continuity of a function
  - Evaluation of limits by L hospital's rule
  - To verify Rolle's theorem for a given function
  - To verify Lagrange's mean values theorem for a given function
  - To verify Cauchy's mean values theorem for a given function
  - To verify Taylor's theorem for a given function
  - To verify whether given sequence is convergent divergent and oscillatory
- To verify whether given series is convergent, divergent and oscillatory

B19SM4080	Statistical Inference Lab-II	L	T	P	C
Duration:14 Wks		0	0	2	2

### Prerequisites:

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

### Course Objectives:

The objectives of this course are:

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

### Course Outcomes:

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

- Infer the experimental data analysis using the tests of hypotheses.
- Discriminate the various applications of tests of significance.
- Analyse the problems using various tests of significance. (changed the added co-3 mapping)
- Investigate the data using nonparametric tests.

## Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM4080	CO1	2	3	2	2	1	2	1	1	3	2
	CO2	2	2	2	2	1	2	1	1	2	2
	CO3	2	2	1	1	1	1	1	1	2	2
	CO4	2	3	2	2	1	2	1	1	2	2

### LabExperiments

#### (Demonstration of practicals using MS-Excel)

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

#### Text books:

1. Walpole, R E, Myers, R H, and Myers, S L (2017). *Probability and Statistics for Engineers and Scientists*, 9/e, Pearson, New Delhi.
2. Mukhopadhyay, P (2015): *Mathematical Statistics*, Books and Allied (P) Ltd., Kolkata.
3. Montgomery, D C and Runger, G C (2013). *Applied Statistics and Probability for Engineers*, Wiley India, New Delhi
4. Chandra, T K and Chatterjee, D (2005). *A First Course in Probability*, Narosa Publishing House, New Delhi..
5. Lehmann, E L and Romano, J P (2005). *Testing Statistical Hypotheses*, 2/e, John Wiley, New York.
6. Hogg, R V and Craig, A T (1995). *Introduction to Mathematical Statistics*, 5/e, Prentice Hall, New Jersey, USA.

#### Reference Books:

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

<b>B19SM4090</b>	<b>Linux Lab</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:**

Operating systems, shell script, file system

**Course Objectives:**

The objectives of this course are to:

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

**Course Outcomes:**

After the completion of the course, the student will 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 scripts

**Mapping of Course Outcomes with Programme Outcomes**

<b>Course Code</b>	<b>POS/ COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PSO1</b>	<b>PSO2</b>
<b>B19SM4080</b>	<b>CO1</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>			<b>1</b>	<b>3</b>	<b>3</b>	<b>2</b>
	<b>CO2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</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>2</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>2</b>	<b>2</b>	<b>3</b>	<b>2</b>

**Lab Experiments**

**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 a given 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 has to 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>B19SM5010</b>	<b>Mathematics –V</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>

**Prerequisites:**

Knowledge of trigonometry, geometry and calculus.

**Course Objectives:**

The objectives of this course are to:

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:**

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

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

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM5010	CO1	3	3	2	3	2				2	1
	CO2	3	3	2	3	2				3	3
	CO3	3	3	1	3	2				3	2
	CO4	3	3	2	3	2				3	3

### Course Contents:

#### Unit-I: Multiple Integral [9 Hrs]

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

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

#### Unit-II: Vector integration [9 Hrs]

Line integrals, Definition and problems, Surface and volume integrals, Green's Theorem, Stoke's and Gauss divergence theorem.

#### Unit-III: Linear Algebra – 1 [9 Hrs]

Vector spaces, General properties of vector spaces, Vector subspaces, Algebra of subspaces, and Linear combination of vectors. Linear span, linear sum of two subspaces, Linear independence and dependence of vectors, Basis of vector space.

#### Unit-IV: Linear Algebra – 2 [9 Hrs]

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

#### 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 edition. New Delhi, India: Wiley India Pvt. Ltd., 2010.
2. S Narayanan & M Pillay, Vector Algebra and Analysis, 4th edition.: SV Publisher, 1986.
3. Raisinghania Md, Saxena Hc, and DassHk, Simplified course in Vector Calculus, 1st ed. New Delhi, India: S.Chand and Company Ltd., 2002.



<b>B19SM5020</b>	<b>Mathematics –VI</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>

**Prerequisites:**

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

**Course Objectives:**

The objectives of this course are to:

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:**

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

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
<b>B19SM5020</b>	<b>CO1</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>				<b>3</b>	<b>3</b>
	<b>CO2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>				<b>3</b>	<b>3</b>
	<b>CO3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>				<b>3</b>	<b>2</b>
	<b>CO4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>				<b>3</b>	<b>3</b>

**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** **[9 Hrs]**

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.

<b>B19SM5030</b>	<b>Design and Analysis of Experiments</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>

**Prerequisites:**

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

**Course Objectives:**

The objectives of this course are to:

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

**Course Outcomes:**

Upon completion of the course, students will be able to

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

**Mapping of Course Outcomes with programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM5030	CO1	2	3	3	3	2	2	2	1	3	3
	CO2	2	3	2	3	1	2	2	1	3	2
	CO3	2	3	2	3	1	2	1	1	3	3
	CO4	2	3	2	3	1	2	1	1	2	3

**Course Contents:****Unit1: Analysis of variance****[9 Hrs]**

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

**Unit2: Experimental designs****[9 Hrs]**

Terminology in experimental designs, Principles of design of experiments. Completely randomized, randomized block and Latin square designs (CRD, RBD, and LSD) -layout formation and statistical

analysis using fixed effect models.

**Unit3: Relative efficiency and Missing plot technique**

[9 Hrs]

Comparison of efficiencies of CRD, RBD, and LSD Estimation of single and two missing observation in RBD and LSD and analysis.

**Unit4: Factorial experiments**

[9 Hrs]

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

**Text books:**

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

**Reference Books:**

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

<b>B19SM5040</b>	<b>Sampling Theory</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>

**Prerequisites:**

Knowledge of summarizing and descriptive statistics, basics of probability and probability distributions.

**Course Objectives:**

The objectives of this course are to:

1. To learn the basic concepts of sample survey and its need.
2. To familiarize with various tools and techniques of sampling
3. To learn to design and conduct statistical surveys.
4. To obtain estimator of the population parameter on the basis of selected sample and study its properties.

**Course Outcomes:**

Upon completion of the course, students will be able to

1. Demonstrate the understanding of the basic concepts of sample survey.
2. Collect data using statistical survey, analyze and interpret the results.
3. Apply the knowledge of various tools and techniques of sampling in real life.
4. Obtain estimator of the population parameter on the basis of selected sample and study its properties.

#### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM5040</b>	<b>CO1</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>			<b>2</b>	<b>1</b>	<b>3</b>	
	<b>CO2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>			<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>
	<b>CO3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>			<b>1</b>	<b>3</b>		<b>3</b>
	<b>CO4</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>			<b>1</b>	<b>3</b>	<b>1</b>	<b>3</b>

#### Course Contents:

##### Unit1

[9 Hrs]

Introduction to sampling theory: Concepts of population and sample. Need for sampling, complete enumeration Vs sample surveys. Principal steps in a sample survey. Planning, execution, analysis and reporting stages. Requisites of a good questionnaire. Drafting of questionnaires and schedules and their pre-test. Pilot surveys. Sampling and non-sampling errors. Types of sampling: non-probability and probability sampling. Methods of drawing random samples-Lottery method and table of random numbers.

##### Unit2

[9 Hrs]

Simple random sampling: Sampling with and without replacement. Unbiased estimators of population mean and total. Derivation of sampling variances. Standard errors of the estimators. Confidence limits. Sampling for proportions. Derivation of the variances of the estimators and their estimation. Determination of sample size. Obtaining the sample size while estimating population proportions and population means. Advantages and limitations of SRS.

##### Unit3

[9 Hrs]

Stratified random sampling: Need for stratification. Unbiased estimator of mean and total in stratified random sampling. Derivation of the variance, standard error of the estimators and their estimation. Allocation of sample size under proportional, optimum and Neyman allocations. Comparison of  $V(\text{ran})$ ,  $V(\text{prop})$  and  $V(\text{opt})$  ignoring fpc. Estimation of gain in precision due to stratification.

##### Unit4

[9 Hrs]

Systematic sampling: Linear systematic sampling, its advantages and limitations. Estimation of mean, total and variance of the estimators. Comparison with SRSWOR. Circular systematic sampling.

**TextBooks:**

1. Goon A.M., Gupta, M.K., Das Gupta, B. (1991).Fundamentals of Statistics, Vol.I, World Press, Calcutta.
2. Cochran,W. G. (2007). Sampling Techniques. 3/e, John Wiley and Sons, New York.
3. Mukhopadhyay, P (1996). Applied Statistics. Calcutta Publishing House

**References:**

1. Des Raj and Chandok, P. (1998). Sampling Theory, Narosa, New Delhi.
2. Mukhopadhyay, P. (2015): Mathematical Statistics, Books and Allied (P) Ltd., Kolkata.
3. Murthy, M.N. (1977). Sampling Theory and Methods, Statistical Publishing Society, Calcutta.
4. Sampath, S. (2006). Sampling Theory and Methods, 2/e, Narosa, New Delhi.

<b>B19SM5050</b>	<b>Java Programming</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>

**Prerequisites:**

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.

**Course Outcomes:**

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.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM5050</b>	<b>CO1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1</b>		<b>2</b>	<b>3</b>	<b>3</b>
	<b>CO2</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>2</b>		<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>

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

**Course Content:**

**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>B19SM5061</b>	<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:**

The objectives of this course are to:

1. To analyze the function of complex variable and its analytic property with a review of elementary complex function.
2. To identify and construct complex-differentiable functions.
3. To use the general Cauchy integral theorem and formula.
4. To understand the Taylor and Laurent expansion with their use in finding out the residue and improper integral.

**Course Outcomes:**

On completion of the course, students will be able to

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
<b>B19SM5061</b>	<b>CO1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>					<b>3</b>	<b>1</b>
	<b>CO2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>					<b>3</b>	<b>2</b>
	<b>CO3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>					<b>3</b>	<b>1</b>
	<b>CO4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>					<b>3</b>	<b>1</b>

**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:**

1. S Shanthinarayan, Complex Analysis, S Chand Co. Pvt. Ltd., 2012.
2. R V Churchill & J W Brown, Complex Variables and Applications, 5<sup>th</sup> edition. TMH 1989.
3. L V Ahlfors, Complex Analysis, 3<sup>rd</sup> edition.: Mc Graw Hill. , 1979.

**References:**

1. A R Vashista, Complex Analysis, Krishna Prakashana Mandir, 2012.
2. Richard R Goldberg, Methods of Real Analysis, Indian ed. New Delhi, India: O&IBH Publishing Co. 1970.
3. G K Ranganath, Text book of B.Sc. Mathematics, Revised ed. New Delhi, India: S Chand Company Ltd., 2011.

<b>B19SM5062</b>	<b>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>0</b>	<b>2</b>

**Prerequisites:**

Knowledge of calculus and intermediate physics

**Course Objectives:**

The objectives of this course are to:

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:**

Upon completion of the course, students will be able to

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
B19SM5062	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****[6 Hrs]**

Velocity, Relative velocity, Angular velocity, Acceleration, Rectilinear motion, Rectilinear motion with constant acceleration, Relative angular velocity, Work, Power, Energy.

**Unit-II****[6 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 problems.

**Unit-III****[6 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****[6 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.

<b>B19SM5063</b>	<b>Number Theory</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 abstract algebra and commutative algebra.

**Course Objectives:**

The objectives of this course are to:

1. Understand the theory of congruence's.
2. Understand the functions of several variables.
3. Familiarize with graphs.
4. Familiarize with the concept of limits and continuity in higher dimensions.

**Course Outcomes:**

Upon completion of the course, students will be able to

1. Discuss the theory of congruence's.
2. Discuss functions of several variables.
3. Produce and interpret graphs of functions of two and three variables.
4. Demonstrate limits and continuity in higher dimensions.

**Mapping of Course Outcomes with Programme Outcomes**

<b>Course Code</b>	<b>POS/COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PSO1</b>	<b>PSO2</b>
<b>B19SM5063</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>2</b>	<b>1</b>				<b>3</b>	<b>2</b>
	<b>CO3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>				<b>3</b>	<b>2</b>
	<b>CO4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>				<b>3</b>	<b>2</b>

**Course Contents:**

**Unit-I****[6 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****[6 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****[6 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****[6 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:**

1. Number Theory by H.S. Hall, S.R. Knight, Maxford Books, 2008.

<b>B19SM5071</b>	<b>Statistical Quality Control(SQC)</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 summarizing and descriptive statistics, plotting graph.

**Course Objectives:**

The objectives of this course are to:

1. To learn the basic concepts of Statistical Quality Control and it's need.
2. To familiarize with techniques and approach of SQC being used in industry to manufacture goods and services of high quality at low cost.

**Course Outcomes:**

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

1. Understand the basic concepts of Statistical Quality Control and it's need

2. Understand the Statistical process control tools- Control charts for variables and attributes.
3. Understand the Statistical product control tools- Sampling inspection plans.
4. Apply the knowledge of various tools and techniques of SQC in real life.

### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM5071	CO1	2	3	3	2	0	0	1	0	3	0
	CO2	3	3	2	3	0	0	1	2	3	1
	CO3	2	3	2	3	0	0	1	2	3	2
	CO4	2	3	2	3	0	0	1	2	0	3

#### Course Contents:

##### Unit 1 [6 Hrs]

Basics of SQC: Introduction to statistical quality control (SQC), aims and objectives. Chance and assignable causes of variation. Process control and product control. Control charts and basis for their construction. Action and warning limits. Various tools of SQC. Rational subgroups.

##### Unit 2 [6 Hrs]

Control charts for variables: Derivation of control limits, basis, construction and interpretation of mean, range and standard deviation charts. Criteria for detecting lack of control.

##### Unit 3 [6 Hrs]

Control charts for attributes: np-chart, p-chart, stabilized p-chart, c-chart and u-chart. Criteria for detecting lack of control.

##### Unit 4 [6 Hrs]

Product control: Lot acceptance sampling- Sampling inspection, 100 percent inspection and rectifying inspection. AQL, LTPD, Producer's risk and consumer's risk. Acceptance sampling plans – single and double sampling plans by attributes- Derivation of OC, AOQ, ASN, and ATI, functions.

#### Text Books:

1. Goon A.M., Gupta, M.K., Das Gupta, B. (1991). Fundamentals of Statistics, Vol.I, World Press, Calcutta.
2. Grant, E.L. and Leavenworth, R. S. (1996). Statistical Quality Control. 7th edition, McGrawHill,

New York.

- Mahajan, M. (2001). Statistical Quality Control, Dhanpat Rai & Co. (P) Ltd. New Delhi.
- Montgomery, D.C. (2013). Introduction to Statistical Quality Control, (Wiley Int. Edn.)

**References:**

- John, S.O. and Followell, R. F. (1990). Statistical Process Control. (East West Press, India.
- Mukhopadhyay, P (1996). Applied Statistics. Calcutta Publishing House.
- Mukhopadhyay, P. (2015): Mathematical Statistics, Books and Allied (P) Ltd., Kolkata.

<b>B19SM5072</b>	<b>Reliability and Survival 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 descriptive statistics, basics of probability, probability distributions and inferential statistics.

**Course Objectives:**

The objectives of this course are to:

- To make to students to understand the basic concepts of reliability theory.
- To learn to evaluate system reliability for series, parallel, k out of n systems
- To learn to handle censored data, techniques and tools to obtain survival probability.
- To get an idea of important lifetime distributions such asexponential and gamma distributions

**Course Outcomes:**

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

- Demonstrate the fundamental concepts reliability theory.
- Understand the fundamental concepts of survival functions and their relationship.
- Handle censored data and estimating mean survival time.
- Model various lifetime distributions for the real life data.

**Mapping of Course Outcomes with Programme Outcomes**

<b>Course Code</b>	<b>POS/ COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PSO1</b>	<b>PSO2</b>
<b>B19SM5072</b>	<b>CO1</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>			<b>1</b>	<b>2</b>	<b>3</b>	
	<b>CO2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>			<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>
	<b>CO3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>			<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>

	CO4	2	3	2	3			1	2	2	3
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**Course Contents:**

**Unit1** **[6 Hrs]**

**Reliability:** Reliability concepts and measures, components & systems, coherent systems, reliability of coherent systems- Series, parallel and k-out-of- n systems.

**Unit 2** **[6 Hrs]**

Survival analysis: Survival functions, hazard rate, cumulative hazard function, residual life time, survival function of residual life time, mean residual life time, one-one correspondence of these functions. Computation of these functions for Common lifetime distributions: exponential and gamma.

**Unit 3** **[6 Hrs]**

Notions of aging: IFR, IFRA, NBU, DMRL, NBUE, and HNBUE classes; their duals. Aging properties of common life time distributions.

**Unit 4** **[6 Hrs]**

Censoring: Concept of censoring, various types of censoring, Estimation and Testing of parameters of exponential distribution under various types of censoring.

**Text Books:**

1. Barlow R.E. and Proschan F. (1975): Statistical Theory of Reliability & Life Testing, Holt, Reinhart and Winston.
2. Cox, D.R. and Oakes, D. (1984). Analysis of Survival Data, Chapman and Hall
3. Deshpande, J.V. and Purohit S.G. (2005). Life Time Data: Statistical Models and Methods, World Scientific.

**References:**

1. Muralidharan, K. and Syamsundar, A. (2012): Statistical Methods for Quality, Reliability and Maintainability, PHI Learning Pvt. Limited.
2. Miller, R.G. (1981) : Survival analysis, John Wiley.

<b>B19SMF5073</b>	<b>Data mining</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 descriptive statistics, basics of probability, probability distributions and inferential statistics.

**Course Objectives:**

The objectives of this course are to:

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

**Course Outcomes:**

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

1. Demonstrate the understanding of concepts of data mining and data warehousing.
2. Process raw data to make it suitable for various data mining algorithms.
3. Apply data mining techniques to find interesting knowledge from various types of databases/datasets.
4. Set up a data mining process for an application to carry out a scientific study.

**Mapping of Course Outcomes with programme Outcomes**

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SMF5073</b>	<b>CO1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>			<b>1</b>	<b>2</b>	<b>3</b>	
	<b>CO2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>			<b>1</b>	<b>3</b>	<b>3</b>	<b>2</b>
	<b>CO3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>			<b>1</b>	<b>3</b>	<b>2</b>	<b>3</b>
	<b>CO4</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>			<b>1</b>	<b>3</b>	<b>2</b>	<b>3</b>

**Course Content:**

**Unit 1** **[6 Hrs]**

Data Mining: Motivations and importance, Knowledge Discovery in Databases (KDD) process - search, induction, querying, approximation and compression. Kinds of data considered for data mining, basic data mining tasks, data mining issues, inter-connections between Statistics, Data Mining, Artificial Intelligence and Machine Learning. Applications of data mining

**Unit 2** **[6 Hrs]**

Data warehousing: Data marts, databases and data warehouses - OLTP systems, multidimensional models – data cubes, OLAP operations on data cubes, multidimensional schemas.  
Data pre-processing – data cleaning, data integration, data transformation and data reduction.

**Unit 3** **[6 Hrs]**



Supervised learning – classification and prediction, statistical classification-Linear Discriminants-Mahalanobis' linear discriminant, Regression based classification. k-NN(nearest neighbor) classifier. Tree classifiers-decision trees, ID3 algorithm CART.

**Unit 4**

**[6 Hrs]**

Unsupervised learning:Clustering problem, similarity and distance measures, Partitioning algorithms-k-means & k-medoids(PAM) algorithms.

**Text Books:**

1. Jiawei Han, Micheline Kamber: (2002): Data Mining-Concepts and Techniques, Morgan Kaufman Publishers, U.S.A
2. Margaret.H. Dunham (2005): Data Mining-Introductory and Advanced Topics, Pearson Education.
3. RajanChattamvelli: (2009): Data Mining Methods, Narosa Publishing House

**References:**

1. Trevor Hastie, Robert Tibshirani& Jerome Friedman (2001):The Elements of Statistical Learning: Data Mining, Inference and Prediction, Springer, New York,
2. Michael Berthold, David J. H and (Eds): (2003) Intelligent Data Analysis - An Introduction (2<sup>nd</sup> Ed), Springer.
3. J.P. Marques de Sa: (2001):Pattern Recognition - Concepts, Methods and Applications, Springer 6.

<b>B19SM5081</b>	<b>Web Programming</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:**

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:**

The objectives of this course are to:

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:**

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

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
B19SM5081	CO1	1	0	0	3	2	2	2	2	1	3
	CO2	2	1	1	3	1	1	1	1	1	3
	CO3	3	1	2	2	3	0	1	2	2	3
	CO4	2	2	2	2	1	0	3	1	2	3

#### Course Contents:

##### Unit 1 [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 2 [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 3 [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 4 [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>B19SM5082</b>	<b>Visual Programming</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:**

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

**Course Objectives:**

The objectives of this course are to:

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:**

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

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	PO7	PO8	PSO1	PSO2
<b>B19SM5082</b>	<b>CO1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
	<b>CO2</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</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>3</b>		<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>
	<b>CO4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>			<b>3</b>	<b>3</b>

**CourseContent:**

**Unit 1** **[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 2** **[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 3** **[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 4** **[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.

<b>B19SM5083</b>	<b>Computer Graphics</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 analytic geometry, linear algebra (vector, matrix), knowledge of C++ is not necessary but is helpful.

**Course Objectives:**

The objectives of this course are to:

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:**

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

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
B19SM5083	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 1****[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 Bresenham's, Line attributes-Circle drawing-Direct and mid-point circle drawing.

**Unit 2****[6 Hrs]**

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

**Unit 3****[6 Hrs]**

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

**Unit 4****[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>B19SM5090</b>	<b>Soft Skill Training</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>B19SM5X10</b>	<b>Design and Analysis of Experiments Lab</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 basics statistics-I & II, basics mathematics, differentiation, and basics statistical inference-I & II.

**Course Objectives:**

The objectives of this course are to:

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

**Course Outcomes:**

Upon completion of the course, students will be able to

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

### Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM5X10	CO1	2	3	3	3	2	2	2	1	3	3
	CO2	2	3	2	3	1	2	2	1	3	2
	CO3	2	3	2	3	1	2	1	1	3	3
	CO4	2	3	2	3	1	2	1	1	2	3

### Lab Experiments

#### (Demonstration of practicals using MS Excel)

1. ANOVA for one way classified data.
2. ANOVA for two way classified data.
3. Analysis of CRD.
4. Analysis of RBD.
5. Analysis of LSD.
6. Missing plot techniques in RBD and LSD
7. Analysis of  $2^2$  factorial experiment using RBD layout.
8. Analysis of  $2^3$  factorial experiment using RBD layout.
9. Analysis of  $2^3$  factorial experiment using RBD layout. (Complete confounding)
10. Analysis of  $2^3$  factorial experiment using RBD layout. (Partial confounding)

#### Text books:

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

#### Reference Books:

4. Mukhopadhyaya, P.(2015): Mathematical Statistics, Books and Allied (P) Ltd., Kolkata.

5. Cochran, W.G. and Cox, G. M. (1992).Experimental Designs, John Wiley and Sons, New York.

<b>B19SM5X20</b>	<b>Java Programming Lab</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 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, GUIbased programming and networking programming.

**Course Outcomes:**

Upon completion of the course, students will be able to

1. Understanding of OOP concepts and basics of Java programming (Console and GUIbased).
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.
4. Test and debug Java programs for errors and exceptions

**Mapping of Course Outcomes with programme Outcomes**

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM5X20</b>	<b>CO1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>		<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>
	<b>CO2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>		<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>
	<b>CO3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>2</b>		<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>
	<b>CO4</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1</b>

**Course Content:**

**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>B19SM5X30</b>	<b>Web Programming Lab</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:

Comfortable using HTML and CSS, modest facility with JavaScript

#### Course Objectives:

The objectives of this course are to:

1. To impart the design, development and implementation of Static and Dynamic Web Pages.
2. To develop programs for Web using Scripting Languages as well as .net framework.
3. To give an overview of Server Side Programming in Web.

#### Course Outcomes:

Upon completion of the course, students will 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. Compare the various types of web services and frameworks

### Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM5X20</b>	<b>CO1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>
	<b>CO2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>
	<b>CO3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>

	CO4	1	3	2	3	2	2	2	3	2	3
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**Course Content:**

**PART – A**

1. Create a form having number of elements (Textboxes, Radio buttons, Checkboxes, and so on). Write JavaScript code to count the number of elements in a form.
2. Create a HTML form that has number of Textboxes. When the form runs in the Browser fill the textboxes with data. Write JavaScript code that verifies that all textboxes has been filled. If a textboxes has been left empty, popup an alert indicating which textbox has been left empty.
3. Develop a HTML Form, which accepts any Mathematical expression. Write JavaScript code to Evaluates the expression and Displays the result.
4. Create a page with dynamic effects. Write the code to include layers and basic animation.
5. Write a JavaScript code to find the sum of N natural Numbers. (Use user-defined function)
6. Write a JavaScript code block using arrays and generate the current date in words, this should include the day, month and year.
7. Create a form for Student information. Write JavaScript code to find Total, Average, Result and Grade.
8. Create a form for Employee information. Write JavaScript code to find DA, HRA, PF, TAX, Gross pay, Deduction and Net pay.
9. Create a form consists of a two Multiple choice lists and one single choice list
  - a. The first multiple choice list, displays the Major dishes available.
  - b. The second multiple choice list, displays the Starters available.
  - c. The single choice list, displays the Soft drinks available.
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>B19SM5X30</b>	<b>Visual Programming Lab</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:**

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:**

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

1. Design, create, build, and debug Visual Basic applications.
2. Apply arithmetic operations for displaying numeric output.
3. Apply decision structures for determining different operations
4. Outline the design process, both in oral and written form

**Mapping of Course Outcomes with programme Outcomes**

<b>Course Code</b>	<b>POS/ Cos</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PSO1</b>	<b>PSO2</b>
<b>B19SM5X30</b>	<b>CO1</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>
	<b>CO2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>3</b>
	<b>CO3</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>3</b>
	<b>CO4</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>

**Course Content:**

**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).

<b>B19SM5X30</b>	<b>Computer Graphics Lab</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 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:**

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

1. To draw Geometric primitives
2. To execute scan line polygon filling
3. To implement basic transformations on objects
4. To understand the working of 3D objects in a plane.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM5X30</b>	<b>CO1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>
	<b>CO2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>
	<b>CO3</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>
	<b>CO4</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>

**Course Content:**

**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).

**Semeste: VI**

<b>B19SM6010</b>	<b>Numerical Methods</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>

**Prerequisites:**

Differential equations and linear algebra

**Course Objectives:**

The objectives of this course are to:

1. To provide students with an introduction to the field of numerical analysis.
2. The course aims to develop and apply problem solving skills through the introduction of numerical methods.
3. To provide a ground for applying knowledge acquired in previous mathematics courses and give students an opportunity to develop and present an independent project.

**Course Outcomes:**

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

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	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM6010</b>	<b>CO1</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>3</b>	<b>3</b>
	<b>CO3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>					<b>3</b>	<b>2</b>
	<b>CO4</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>					<b>3</b>	<b>3</b>

### Course Contents:

#### **Unit-I: Numerical Solution of algebraic and system of equations [9 Hrs]**

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 – Lagrange’s 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 [9Hrs]**

Differential Equations and simultaneous DE: 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 SSastry, 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.

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

**Reference Books:**

- Erwin Kreyszig Advanced Engineering Mathematics, 8<sup>th</sup> Ed. New Delhi, India: Wiley India Pvt. Ltd., 2010.
- M K Jain, S R K Iyengar, and R K Jain, Numerical Methods for Scientific and Engineering Computation, 4<sup>th</sup> Ed. New Delhi, India: New Age International, 2003.

<b>B19SM6020</b>	<b>Operations Research</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>

**Prerequisites:**

Knowledge of linear algebra, basics of probability and probability distributions

**Course Objectives:**

The objectives of this course are to:

- To study the fundamentals of operations research.
- To understand the mathematical formulation of linear programming problems and their applications in real life problems.
- To study various operational research techniques and models.

**Course Outcomes:**

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

- Demonstrate the understanding of fundamentals of operations research.
- Develop a mathematical formulation of an LPP.
- Apply appropriate operational research techniques and models to real life situations.
- Understand various decision making problems and their solutions.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM6020</b>	<b>CO1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>0</b>
	<b>CO2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>
	<b>CO3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>3</b>
	<b>CO4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>3</b>

**Course Content:**



**Unit 1** **[9 Hrs]**

**Introduction to OR and LPP:** Definition, scope and phases of operations research (OR). Modeling and solution. Various types of OR problems. Linear programming problem (LPP): Definition, standard and canonical forms. Formulation of LPP. Basic feasible solutions, degenerate and non degenerate solutions. Graphical solution and simplex algorithm for solving an LPP. Artificial variable, Charnes' Big- M Method. Criteria for unbounded, multiple, and infeasible solutions

**Unit 2** **[9 Hrs]**

**Transportation and assignment problems:** Mathematical formulation of transportation problem. Existence of feasible solution. Finding initial basic feasible solution: North - West corner rule and Vogel's method. Test for optimality. Transportation algorithm. Problem of degenerate solution. Unbalanced transportation problem. Mathematical formulation of assignment problem and Hungarian algorithm. Unbalanced assignment problem.

**Unit 3** **[9 Hrs]**

**Inventory and replacement theory:** Description of an inventory system. Inventory costs. Demand, leadtime, and reorder level. Inventory models. EOQ model with and without shortages. Need for replacement. Replacement policy for items which deteriorate with time. Optimum policy with discrete and continuous time. Group replacement policy.

**Unit 4** **[9 Hrs]**

**Game Theory and Network theory:** Game Theory: Basic concepts of game theory. Two - person zero sum game. Pure and mixed strategies. Maximin–Minimax principles, Games with saddle point. Principle of dominance Games without saddle point. Mixed strategies. Determination of optimum solution for a 2x2 game. Solution by graphical method for 2xn and mx2 games. Network theory: Basic elements of Network. Drawing of project network. Project planning with CPM and PERT. Critical path calculation. Critical path, slack time, floats. PERT three estimate approach. Calculation of probabilities of completing a Project within a specified period.

**Text Books:**

1. Churchman, C.W, Ackoff, R.L., and Arnoff, E.L. (1957). *Introduction to Operations Research*, John Wiley and Sons, New York.
2. KanthiSwaroop, Manmohan and P.K. Gupta (2012). *Operations Research*, Sultan Chand, New Delhi.
3. Kalavathy, S.(2004). *Operations Research*, Vikas Publishing House Pvt. Ltd. New Delhi.
4. Shenoy, G.V., Srivastava, U. K., and Sharma, S.C. (2009). *Operations Research for Management, 2/e*, New Age International, New Delhi.

**References:**

1. Mustafi, C.K. (2006). *Operations Research: Methods and Practice*, 3/e, New Age International, New Delhi.
2. Mital, K.V. and Mohan, C. (2004). *Optimization Methods*, 3/e, New Age International, New Delhi.
3. Narag, A. S. (1970). *Linear Programming and Decision Making*, S. Chand, New Delhi.
4. Hillier, F.S. and Lieberman, G. J. (1962). *Introduction to Operations Research*, Holden Day, New York.
5. Taha, H.A. (2010). *Operational Research: An Introduction*, Macmillan, New York.

<b>B19SM6030</b>	<b>Software Engineering</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>Duration:14 Wks</b>		<b>1</b>	<b>1</b>	<b>0</b>	<b>2</b>
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**Prerequisites:**

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

**Course Objectives:**

The objectives of this course are to:

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:**

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

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**

<b>Course Code</b>	<b>POS/COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PSO1</b>	<b>PSO2</b>
<b>B19SM6030</b>	<b>CO1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1</b>					<b>3</b>	<b>2</b>
	<b>CO2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>1</b>			<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>
	<b>CO3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>
	<b>CO4</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>			<b>3</b>		<b>3</b>	<b>2</b>

**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. PankajJalote, "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.

<b>B19SM6041</b>	<b>Fuzzy Mathematics</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 set theory

### Course Objectives:

The objectives of this course are to:

1. Students will study the fuzzy sets, basic operation on fuzzy sets and inverse fuzzy operations.
2. Students will study fuzzy subsets and its properties.
3. Student will read and analyze the concept of fuzzy rings

### Course Outcomes:

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

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

### Mapping of Course Outcomes with Program Outcomes

Course Code	POS/Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM6041	CO1	3	3	2	3					2	3
	CO2	3	3	2	2					3	3
	CO3	3	2	3	3					3	2
	CO4	3	3	3	2					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 and logic connectives.

#### Unit – IV [6 Hrs]

Some more connectives, Introduction, fuzzy subgroup, homomorphic image and Preimage of subgroupoid. Fuzzy invariant subgroups and fuzzy subrings.

### Text Books:

1. S. Nanda and N. R. Das Fuzzy Mathematical concepts, Narosa Publishing House, New Delhi, 2010.

**Reference Books:**

1. M.Ganesh, Introduction to Fuzzy Sets & Fuzzy Logic, Prentice Hall of India Pvt. Ltd., 2006.
2. John N.Mordeson and PremchandS.Nair, Fuzzy Mathematics.

<b>B19SM6042</b>	<b>Topology</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:**

Set theory and properties of set theory.

**Course Objectives:**

The objectives of this course are to:

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:**

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

1. Analyze different axioms of Topology.
2. Learn Homotopy Theory.
3. Analyze fundamental groups of  $S_1$  and  $S_n$ .
4. Analyze 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
<b>B19SM6042</b>	<b>CO1</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>				<b>3</b>	<b>3</b>
	<b>CO2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>				<b>2</b>	<b>3</b>
	<b>CO3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>				<b>3</b>	<b>3</b>
	<b>CO4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>				<b>3</b>	<b>2</b>

**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.

**Reference Books:**

1. W. Fulton and J. Harris. Representation Theory.
2. F.W. Warner. Foundations of Differentiable Manifolds and Lie Groups.

<b>B19SM6043</b>	<b>Discrete Mathematics and Graph Theory</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:**

Sets, relations, trees, graphs and Boolean algebra.

**Course Objectives:**

The objectives of this course are to:

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

**Course Outcomes:**

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

1. Apply operations on discrete structures such as sets, relations, functions and Recurrence relations.

2. Apply Boolean algebra to switching theory and their minimization techniques and Phase structure, grammars and languages, Finite State Machine, Recognition in regular languages.
3. Apply principles and concepts of graph theory in practical situations
4. Apply the theory and applications of graphs, fundamental theorems and their proofs and computer applications such as networks of communication, data organizations, computational devices and 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
B19SM6043	CO1	3	3	2	2	3				3	3
	CO2	3	2	3	2	2				2	3
	CO3	3	3	2	3	3				3	2
	CO4	3	3	3	2	2				3	3

#### Course Contents:

#### Unit-I: Discrete numeric functions and Generating functions: [6Hrs]

Introduction, Manipulation of numeric functions, Asymptotic behavior 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. NarsingDeo: Graph Theory & Applications (PHI), India.
2. Frank Harray: Graph Theory Narosa Publications, India.

<b>B19SM6051</b>	<b>Applied Statistics</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 basic mathematics and basic statistics.

**Course Objectives:**

The objectives of this course are to:

1. To study the demographic data with its sources and measures.
2. To learn the fundamentals of index numbers and their types along with their construction.
3. To understand time series data, components of time series and their measurements.
4. To know about the official statistical system in India and functions of different agencies.

**Course Outcomes:**

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

1. Demonstrate demographic analysis of real life data.
2. Understand the fundamentals of index numbers and able to construct index numbers for real life data.
3. Perform basic analysis of time series data
4. Understand the present official statistical system in India and the functions of C.S.O. and N.S.S.O.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM6051</b>	<b>CO1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>			<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>
	<b>CO2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>			<b>1</b>	<b>3</b>	<b>2</b>	<b>2</b>
	<b>CO3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>			<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>
	<b>CO4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>			<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>

**Course Contents:****Unit 1****[6 Hrs]**

**Demography:** Sources of demographic data. Measurement of mortality: Crude, specific, and standardized death rates. Infant and maternal mortality rates. Measurement of fertility: crude, age



specific general and total fertility rates. Reproduction rates. Life table: Components of a life table, force of mortality, and Expectation of life. Construction of a life table. Uses of a life table.

**Unit 2** **[6 Hrs]**

**Index numbers:** Introduction. Price and quantity index numbers. Construction of index numbers: Simple and weighted methods. Tests for consistency of index numbers. Consumer price index. Problems involved in the construction of general and consumer price index numbers. Uses and limitations.

**Unit 3** **[6 Hrs]**

**Time series analysis:** Components of time series. Additive and multiplicative models. Measurements of trend by moving averages and by least squares. Construction of seasonal indices by simple averages and ratio to moving averages.

**Unit 4** **[6 Hrs]**

**Official Statistics and national income:** History of Indian Statistical System. Pre and post-independence era. CSO NSSO and their activities. National income. Basic concepts of GNP, GDP, NNP. National Income at factor cost – NDP, per capita income. Real national income. Methods of estimating national income. Problems in estimating national income. Uses of national income statistics. National accounts statistics of CSO.

**Text Books:**

1. Goon A.M., Gupta, M.K., Das Gupta, B. (1991). *Fundamentals of Statistics*, Vol. II, World Press, Calcutta.
2. Montgomery, D.C. and Runger, G.C. (2013). *Applied Statistics and Probability for Engineers*, Wiley India, New Delhi.
3. Saluja, M. R. (1972). *Indian Official Statistical Systems*, Statistical Publishing Society, Calcutta

**References:**

1. CSO (1980). *National Accounts Statistics - Sources and Health*, Govt. of India, New Delhi.
2. UNESCO: Principles for Vital Statistics Systems. Series M -12.
3. Sen, A. (1997). *Poverty and Inequality*, Stanford University Press, USA.
4. Mukhopadhyay, P. (2015). *Applied Statistics*, Books and Allied Pvt Ltd., Kolkata.

<b>B19SM6052</b>	<b>Econometrics</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, calculus, descriptive statistics, probability distributions and statistical inference.

**Course Objectives:**

The objectives of this course are to:

1. To develop an understanding of fundamental concepts of econometric models.
2. To introduce regression analysis to students so that they are able to understand its applications in different fields in economics.
3. To know the assumptions and inferential aspects of regression models.

**Course Outcomes:**

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

1. Demonstrate an understanding of fundamental concepts of econometric models.
2. Specify the assumptions and perform an inferential analysis of regression models.
3. Apply econometric models to real life data.
4. Distinguish the results of violating the assumptions of the classical regression model.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM6052	CO1	3	3	3	2			1	1	2	
	CO2	3	2	2	3			1	3	2	2
	CO3	2	3	3	3			1	3	3	3
	CO4	3	3	2	3			1	3	3	3

**Unit 1** **[6 Hrs]**  
**Introduction:** Econometrics-nature, models-linear and non-linear, aims, types of data. Econometrics and statistics. Econometrics and regression analysis.

**Unit 2** **[6 Hrs]**  
**Simple linear regression analysis:** Definition. Model, Ordinary Least Square (OLS) estimators-properties, Inference in the least square model.  
**Course Contents:**

**Unit 3** **[6 Hrs]**  
**Multiple linear regression analysis:** Definition, model, assumptions of model, Ordinary Least Square (OLS) estimators-properties, Gauss-Morkov theorem, concept of ANOVA and R-square, Inference in the model.

**Unit 4** **[6 Hrs]**  
**Violations of Classical Assumptions:** Multicollinearity: Sources, Consequences, Detection and Remedies; Heteroscedasticity- tests, consequences, detection and solution; Autocorrelation-sources, consequences, detection and remedial measures.

**Text Books:**

1. Jack Johnston and John DiNardo (1997):Econometric Methods, Third edition, McGraw Hill.
2. G.S. Maddala (2002): Introduction to Econometrics, Third edition, John Wiley.
3. DamodarGujrati (2003):Basic Econometrics, McGraw Hill.

**References:**

1. Badi H. Battagi (2002): Econometrics, 3rd Ed., Springer
2. Draper N.R. and Smith H. (1998): Applied Regression Analysis, 3rd Ed., John Wiley and Sons, Inc.

<b>B19SM6053</b>	<b>Actuarial Statistics</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 financial mathematics, linear algebra, calculus, descriptive statistics, probability distributions and statistical inference.

**Course Objectives:**

The objectives of this course are to:

1. To provide students with the theoretical background needed to qualify them to pursue graduate level education in Actuarial Science or related fields.
2. To equip students to apply mathematical and statistical knowledge in the field of insurance and finance.
3. To equip students with concepts of actuarial science and different premium models
4. To assist students to construct mathematical and statistical models for real life data in the field of insurance, finance and financial risk management

**Course Outcomes:**

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

1. Demonstrate a solid foundation in actuarial statistics.
2. Understand the concepts of actuarial science and different premium models.
3. Apply actuarial statistics in various fields like insurance, finance and financial risk management.
4. Use appropriate modeling techniques to conduct quantitative risk analysis.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM6053</b>	<b>CO1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>			<b>1</b>	<b>1</b>	<b>3</b>	

	CO2	3	2	2	3			1	3	3	1
	CO3	2	3	3	3			1	3	1	3
	CO4	3	3	2	3			1	3	2	3

**Course Contents:**

**Unit 1** **[6 Hrs]**  
**Insurance business:**– Introduction, Insurance Companies as Business Organizations, Concept of Risk, types of risk, characteristics of risk; premium, policy, policyholder and benefit. Role of Statistics in insurance, insurance business in India.

**Unit 2** **[6 Hrs]**  
**Survival distribution:** Future life time random variable- distribution function and density function, concept of force of mortality, curate future life time random variable its probability mass function, deferred probabilities, all these functions in terms of international actuarial notation.

**Unit 3** **[6 Hrs]**  
**Life tables:** Life table and its relation with survival function, examples, assumptions for fractional ages, some analytical laws of mortality, select and ultimate tables.

**Unit 4** **[6 Hrs]**  
**Principles of compound interest:** Nominal and effective rates of interest and discount, force of interest and discount, compound interest, accumulation factor, continuous compounding.

**Text books:**

1. Bowers N.L. Jr., H.S.Gerber, J.C. Hickman, D.A.Jones, C.J.Nesbitt, (1997). Actuarial Mathematics, Society of Actuaries, U.S.
2. Deshmukh, S. R. (2009). Actuarial Statistics, Universities Press, Hyderabad, India.

**References:**

1. Dickson, C. M. D. (2005): Insurance Risk And Ruin (International Series On Actuarial Science), Cambridge University Press.
2. Benjamin, B. and Pollard, J.H. (1980) Analysis of Mortality and Other Actuarial Statistics, 2nd edition, Heinemann, London.

<b>B19SM6061</b>	<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>0</b>	<b>0</b>	<b>2</b>

**Prerequisites:**

Data communications, digital transmissions, protocols and layers.

## Course Objectives:

The objectives of this course are to:

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

## Course Outcomes:

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

1. Recognize the technological trends of Computer Networking.
2. Discuss the key technological components of the Network.
3. Evaluate the challenges in building networks and solutions to those.
4. 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>B19SM6061</b>	<b>CO1</b>	<b>3</b>	<b>2</b>				<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>
	<b>CO2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>
	<b>CO3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>
	<b>CO4</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>

## Course Content:

### 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 cods-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 –IPv6 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:**

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

<b>B19SM6062</b>	<b>Design and Analysis of Algorithms</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 mathematics and C programming basics

**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:**

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

1. Ability to Understand, Analyze the performance of recursive and non-recursive algorithms and use of asymptotic notations to measure the performance of algorithms.
2. Identify and analyze various algorithm design techniques.
3. Understand and evaluate algorithms using various algorithm design techniques.
4. 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
B19SM6062	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 Content:**

**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 cost spanning 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.

B19SM6063	Computer Architecture	L	T	P	C
Duration :14 Wks		2	0	0	2

**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.

**Course Outcomes:**

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

1. Understand the functional units of the processor such as the register file and arithmetic-logical unit, and with the basics of systems topics.
2. Interpret the design trade-offs in designing and constructing a computer processor.
3. Implement the basic knowledge of I/O devices and interfacing of I/O devices with computer.
4. 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>B19SM6063</b>	<b>CO1</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>
	<b>CO2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</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>2</b>	<b>2</b>	<b>2</b>
	<b>CO4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>			<b>2</b>	<b>2</b>	<b>2</b>

**Course Content:**

**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.MorisMano, Computer System, Architecture, 2<sup>nd</sup> Edition Prentice Hall of India.

**Reference Books:**

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

<b>B19SM6070</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>B19SM6080</b>	<b>Skill Development Courses</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>B19SM6090</b>	<b>Mathematics-V Lab</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:**

Definition of linear transformations, evaluation of double and triple integrals

**Course Objectives:**

The objectives of this course are to:

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.

**Course Outcomes:**

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

1. Determine and apply divergence, curl and scalar potential associated with scalar and vector fields.
2. Apply Fundamental theorem to evaluate Area, Region and Volume of geometrical bodies using Green’s theorem, Stoke’s theorem or Gauss divergence theorem .
3. Describe and manipulate vector spaces, subspaces and their bases.
4. Determine the kernel, image space and matrix representation of a linear transformation.

**Mapping of Course Outcomes with Programme Outcomes**

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
B19SM6090	CO1	3	2	2	2					3	3
	CO2	3	2	3	2					2	2
	CO3	3	3	2	3					3	3
	CO4	3	2	2	2					3	3

**Lab Experiments**

1. Verification of Green’s theorem.
2. Verification of Gauss Divergent theorem.
3. Verification of stokes theorem
4. Expressing a vector as a linear combination of given set of vectors
5. Examples on linear dependence and independence of vectors
6. Evaluation of basis and dimension
7. Verifying whether a given transformation is linear or not
8. Finding a matrix of linear transformation
9. Verification of Rank nullity theorem.
10. To demonstrate the physical interpretation of gradient,divergence and curl..
11. Evaluation of the line integral with constant limits.
12. Evaluation of the line integral with variable limits.

13. Evaluation of the double integral with constant limits.
14. Evaluation of the double integral with variable limits.
15. Evaluation of the triple integral with constant limits.
16. Evaluation of the triple integral with variable limits.
17. Evaluation of surface area of revolution.
18. Evaluation of volume of revolution.

<b>B19SM6X10</b>	<b>Numerical Methods – Lab</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 concepts of numerical methods

**Course Objectives:**

The objectives of this course are to:

1. To provide students with an introduction to the field of numerical analysis.
2. Aside from developing competency in the topics and emphases listed, the course aims to develop and apply problem solving skills through the introduction of numerical methods;
3. To provide a ground for applying knowledge acquired in previous mathematics courses and give students an opportunity to develop and present an independent project.

**Course Outcomes:**

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

1. Acquire proficiency in using MAXIMA to study Numerical Analysis.
2. Use MAXIMA to solve the system of equations.
3. Be familiar with the built-in functions to find the largest eigen value using power method.
4. Acquire proficiency in using Maxima to study the solution of Integrals using interpolation.

**Mapping of Course Outcomes with Programme Outcomes**

<b>Course Code</b>	<b>POS/COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PSO1</b>	<b>PSO2</b>
<b>B19SM6X10</b>	<b>CO1</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>					<b>2</b>	<b>3</b>
	<b>CO2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>					<b>3</b>	<b>2</b>
	<b>CO3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>					<b>3</b>	<b>2</b>

	CO4	3	3	2	2					3	3
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### Lab Experiments

1. Solving algebraic equation using the Bisection method
2. Solving algebraic equation using the Regular – 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 Eigenvalue 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.

<b>B19SM6X20</b>	<b>Operations Research Lab</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 linear algebra, basics of probability and probability distributions

#### Course Objectives:

knowledge of linear algebra, basics of probability and probability distributions

The objectives of this course are to:

1. To make students to gain practical knowledge to co-relate with the theoretical studies.
2. To prepare students to formulate real-world problems as a linear programming problem
3. To obtain optimal solution to a given LPP using different methods.

#### Course Outcomes:

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

1. Demonstrate the understanding of theoretical knowledge practically.
2. Formulate real-world problems as a linear programming problem
3. Obtain optimal solution to a given LPP using different methods
4. Demonstrate the solution methods to different LPP’s.

### Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
<b>B19SM6X20</b>	<b>CO1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>
	<b>CO2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>2</b>
	<b>CO3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>
	<b>CO4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>

### Lab Experiments

1. Formulation of linear programming problem (LPP) - graphical solution.
2. Solution of LPP - simplex algorithm - 1
3. Solution of LPP - simplex algorithm - 2
4. Transportation problems - 1 (IBFS)
5. Transportation problems - 2 (OBFS)
6. Assignment problems
7. Game theory problems.
8. Inventory problems
9. Replacement problems
10. PERT & CPM

#### **Text Books:**

1. Churchman, C.W, Ackoff, R.L., and Arnoff, E.L. (1957). *Introduction to Operations Research*, John Wiley and Sons, New York.
2. KanthiSwaroop, Manmohan and P.K. Gupta (2012). *Operations Research*, Sultan Chand, New Delhi.
3. Kalavathy, S.(2004). *Operations Research*, Vikas Publishing House Pvt. Ltd. New Delhi.
4. Shenoy, G.V., Srivastava, U. K., and Sharma, S.C. (2009). *Operations Research for Management,2/e*, New Age International, New Delhi.

#### **References:**

1. Mustafi, C.K. (2006). *Operations Research: Methods and Practice*, 3/e, New Age International, New Delhi.
2. Mital, K.V. and Mohan, C. (2004 ). *Optimization Methods*, 3/e, New Age International, New Delhi.
3. Narag, A. S. (1970). *Linear Programming and Decision Making*, S. Chand, New Delhi.
4. Hillier, F.S. and Lieberman, G. J. (1962). *Introduction to Operations Research*, Holden Day, New.
5. Taha, H.A. (2010). *Operational Research: An Introduction*, Macmillan, New York.

<b>B19SM6X30</b>	<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:**

The objectives of this course are to:

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:**

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

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>B19SM6X30</b>	<b>CO1</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>
	<b>CO2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>3</b>
	<b>CO3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>
	<b>CO4</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>

## **CAREER OPPURTUNITIES**

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 improves their employability. In addition, CDC forms teams to perform mock interviews. It makes you to enjoy working with such teams and learn many things apart from working together in a team. It also makes you to participate in various student clubs which helps in developing team culture, variety of job skills and overall personality.

The need of the hour in the field of Mathematics, Statistics and computer science is not only the knowledge in the subject, but also the skill to do the job proficiently, team spirit and a flavour of innovation. This kept in focus, the CDC has designed the training process, which will commence from second semester along with the curriculum. Special coaching in personality development,

career building, English proficiency, reasoning, puzzles, and communication skills to every student of REVA .

University is given with utmost care. The process involves continuous training and monitoring the students to develop their soft skills including interpersonal skills that will fetch them a job of repute in the area of his / her interest and march forward to make better career. The School of Applied sciences also has emphasised subject based skill training through lab practice, internship, project work, industry interaction and many such skilling techniques. The students during their day to day studies are made to practice these skill techniques as these are inbuilt in the course curriculum. Concerned teachers also continuously guide and monitor the progress of students.

The University has also established University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director to facilitate skill related training to REVA students and other unemployed students around REVA campus. The center conducts variety of skill development programs to students to suite to their career opportunities. Through this skill development centre the students shall compulsorily complete at least two skill / certification-based programs before the completion of their degree. The University has collaborations with Industries, Corporate training organizations, research institutions and Government agencies like NSDC (National Skill Development Corporation) to conduct certification programs. REVA University has been recognised as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal Vikas Yojana.

The University has also signed MOU's with Multi-National Companies, research institutions, and universities abroad to facilitate greater opportunities of employability, students' exchange programs for higher learning and for conducting certification programs.



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