



SCHOOL OF APPLIED SCIENCES

B. Sc., (Mathematics, Statistics, Computer science)

HANDBOOK

2018-21

Rukmini Knowledge Park,
Kattigenahalli, Yelahanka, Bangalore-560064
Phone No: +91-080-66226622, Fax: 080-28478539

Rukmini Educational
Charitable Trust

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

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

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

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

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

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

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

The University has collaborations with Industries, universities abroad, research institutions, corporate training organizations, and Government agencies such as Florida International University, Oklahoma State University,

Western Connecticut University, University of Alabama, Huntsville, Oracle India Ltd, Texas Instruments, Nokia University Relations, EMC², VMware, SAP, Apollo etc, to facilitate student exchange and teacher–scholar exchange programs and conduct training programs. These collaborations with foreign universities also facilitates students to study some of the programs partly in REVA University and partly in foreign university, viz, M.S in Computer Science one year in REVA University and the next year in the University of Alabama, Huntsville, USA.

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

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

As a part of our effort in motivating and inspiring youth of today, REVA University also has instituted awards and prizes to recognize the services of teachers, researchers, scientists, entrepreneurs, social workers and such others who have contributed richly for the development of the society and progress of the country. One of such award instituted by REVA University is **‘Life Time Achievement Award’** to be awarded to successful personalities who have made mark in their field of work. This award is presented on occasion of the **“Founders’ Day Celebration”** of REVA University on 6th January of every year in presence of dignitaries, faculty members and students gathering. The first “REVA Life Time Achievement Award” for the year 2015 has been awarded to Shri. Kiran Kumar, Chairman ISRO, followed by Shri. Shekhar Gupta, renowned Journalist for the year 2016, Dr K J Yesudas, renowned play back singer for the year 2017. REVA also introduced **“REVA Award of Excellence”** in the year 2017 and the first Awardee of this prestigious award is Shri Ramesh Aravind, Actor, Producer, Director, Screen Writer and Speaker.

REVA organizes various cultural programs to promote culture, tradition, ethical and moral values to our students. During such cultural events the students are given opportunities to unfold their hidden talents and motivate them to contribute innovative ideas for the progress of the society. One of such cultural events is REVAMP conducted every year. The event not only gives opportunities to students of REVA but also students of other Universities and Colleges. During three days of this mega event students participate in debates, Quizzes, Group discussion, Seminars, exhibitions and variety of cultural events. Another important event is Shubha Vedaaya, - Graduation Day for the final year students of all the programs, wherein, the outgoing students are felicitated and are addressed by eminent personalities to take their future career in a right spirit, to be the good citizens and dedicate themselves to serve the society and make a mark in their respective spheres of activities. During this occasion, the students who have achieved top ranks and won medals and prizes in academic, cultural and sports activities are also recognized by distributing awards and prizes. The founders have also instituted medals and prizes for sports achievers every year. The physical education department conducts regular yoga classes everyday to students, faculty members, administrative staff and their family members and organizes yoga camps for villagers around.

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

Vision

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

Mission

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

- To promote industry-institute partnerships and share knowledge for innovation and development
- To organize society development programs for knowledge enhancement in thrust areas
- To enhance leadership qualities among the youth and enrich personality traits, promote patriotism and moral values.

Objectives

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

ABOUT SCHOOL OF APPLIED SCIENCES

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

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

Vision

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

Mission

To achieve excellence in studies and research through pedagogy and support interface between industry and academia

BOS



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

Date of Meeting: 30th May 2018

Time: 10.30 AM

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

Proceedings

At the outset, Dr.Harish Babu.G.A, the Chairperson of the BoS, Professor and Coordinator of the Department Of Mathematics, welcomed all the members present, explained the purpose of the meeting and the agenda in brief. Then the agenda was taken up for discussion.

Agenda 1:

Preparation of Course Curriculum

The Chairperson explained briefly about the establishment of REVA University and the course being introduced under REVA University. He also explained the features of CBCS/CAGP of education the University is committed to follow since its inception itself. He requested all the members to cooperate and to draft the curriculum as per the REVA University Regulations for CBCS-CAGP for UG Applied Sciences program.

The BoS members discussed the agenda in detail and drafted the course curriculum including the scheme of instruction, eligibility criterion, etc. The Board also drafted detailed syllabus.

Resolution:

The Board unanimously resolved to adopt CBCS-CAGP of education for B. Sc – M St Cs (Mathematics, Statistics and Computer Science) from the Academic Year 2018-21 and recommend the University to adopt detailed curriculum drafted, which is provided in Annexure 2.

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
BSMS18F1010	CO1					3	3	3	1		
	CO2					3	3	3	2		
	CO3					3	3	3	2		
	CO4					3	3	3	1		
BSMS18F1020	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			
BSMS18F1020	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			
BSMS18F1020	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		
BSMS18F1030	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

BSMS18F1040	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
BSMS18F1050	CO1	3	3	3	3	2	0	1	3	3	3
	CO2	3	3	3	3	2	0	3	3	3	3
	CO3	3	3	3	2	2	0	2	3	3	3
	CO4	3	3	3	2	2	0	0	0	2	2
BSMS18F1060	CO1	3	3	2	2					2	3
	CO2	3	2	2	3					3	2
	CO3	3	2	3	2					3	2
	CO4	3	3	3	2					3	3
BSMS18F1070	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
BSMS18F1080	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
BSMS18F1090	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

BSMS18F2010	CO1					3	3	3	1		
	CO2					3	3	3	2		
	CO3					3	3	3	1		
	CO4					3	3	3	1		
BSMS18F2020	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		
BSMS18F2020	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			
BSMS18F2020	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		
BSMS18F2030	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
BSMS18F2040	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

BSMS18F2050	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
BSMS18F2060	CO1	1	2	1	1	1	2	3	1	1	1
	CO2	1	3	1	1	1	3	3	1	1	1
	CO3	2	3	2	1	3	3	3	1	1	1
	CO4	1	2	1	1	1	2	3	1	1	1
BSMS18F2080	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
BSMS18F2090	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
BSMS18F2100	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
BSMS18F3010	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

BSMS18F3020	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		
BSMS18F3020	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			
BSMS18F3020	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		
BSMS18F3030	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
BSMS18F3040	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
BSMS18F3050	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

BSMS18F3060	CO1	3	2	2	2					2	3
	CO2	3	2	2	2					3	2
	CO3	3	2	2	2					3	3
	CO4	3	3	2	2					2	3
BSMS18F3070	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
BSMS18F3080	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
BSMS18F3090	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
BSMS18F4010	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		
BSMS18F4020	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		

BSMS18F4020	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			
BSMS18F4020	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		
BSMS18F4030	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
BSMS18F4040	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
BSMS18F4050	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
BSMS18F4070	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

BSMS18F4080	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
BSMS18F4090	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
BSMS18F5010	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
BSMS18F5020	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
BSMS18F5030	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
BSMS18F5040	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
	CO1	3	2	3	2	3	1		2	3	3

BSMS18F5050	CO2	2	1	3	1	2		2	3	3	2
	CO3	2	1	3		1		3	1	2	3
	CO4	3	2	3	2	3	1		2	3	3
BSMS18F5061	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
BSMS18F5062	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
BSMS18F5063	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
BSMS18F5071	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
BSMS18F5072	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
BSMS18F5073	CO1	3	3	3	2			1	2	3	
	CO2	3	2	2	3			1	2	3	1

	CO3	2	3	3	3			1	2	3	3
	CO4	2	3	2	3			1	2	2	3
BSMS18F5081	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
BSMS18F5082	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
BSMS18F5083	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
BSMS18F5100	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
BSMS18F5200	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
BSMS18F5300	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
BSMS18F5300	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
BSMS18F5300	CO1	1	1	2	3	2	1	2	1	2	1
	CO2	2	2	2	3	2	2	2	2	2	2
	CO3	1	2	1	3	3	3	1	1	1	2
	CO4	2	3	2	2	1	2	3	3	2	3
BSMS18F6010	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
BSMS18F6020	CO1	3	3	3	2	0	0	1	2	3	0
	CO2	3	2	2	3	0	0	1	2	2	2
	CO3	2	3	3	3	0	0	1	3	1	3
	CO4	3	3	2	3	0	0	1	3	2	3
BSMS18F6030	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
BSMS18F6041	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

BSMS18F6042	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
BSMS18F6043	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
BSMS18F6051	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
BSMS18F6052	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
BSMS18F6053	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
BSMS18F6061	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
	CO1	3	3	2	3	2	1	1	2	2	2

BSMS18F6062	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
BSMS18F6063	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
BSMS18F6090	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
BSMS18F6100	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
BSMS18F6200	CO1	3	3	3	2	1	0	1	1	2	3
	CO2	3	2	2	3	1	0	1	3	1	2
	CO3	2	3	3	3	1	0	1	3	3	3
	CO4	3	3	2	3	1	0	1	3	3	3
BSMS18F6300	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, 2018

(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 Under Graduate Degree Programs-2018**”.

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 Three Year 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 Three Year degree programs

Course Type	Credits for Three Year Degree (6 semesters)
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
Total	144

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.

RULO Courses		
Sl. No.	Course Title	Number of Credits

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	6th week from the starting date of semester	15
	Test-2: IA2	12th week from the starting date of semester	15
C2	1 Assignment 1	7th week	10
	2 Assignment 2	13th week	10
C3	SEE including practical	between 17th Week-20th Week	50
Results to be Announced			By the end of 21st Week

Note: IA or CIA includes C1 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 th week from the start date of project semester	Weightage: 25%
3	Dissertation progress presentation-2	14 th Week from the start date of project semester	Weightage -25%
4	Final project Viva and Dissertation Submission	17 th -20 th 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 ($P = \frac{C1+C2+C3}{P}$) 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: $SGPA (Si) = \frac{\sum(Ci \times Gi)}{\sum Ci}$ where Ci is the number of credits of the i th course and Gi is the grade point scored by the student in the i th course.

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, $SGPA = \frac{188}{24} = 7.83$

Illustration No. 2

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

Course 7	2	B+	7	2X7=21
Course 8	2	O	10	2X10=20
	24			175

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

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
Cumulative	96		778.08

Thus, $CGPA = \frac{24 \times 6.83 + 24 \times 7.13 + 24 \times 8.68 + 24 \times 9.20}{96} = 8.11$

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.

Eligibility for B. Sc (MStCs) program

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

B. Sc – M St Cs
(Mathematics, Statistics and Computer Science)
Scheme of Instruction 2018-21
Duration: 6 Semesters (3 Years)

Sl. No	Course Code	Title of the Course	HC/S C/ SE/CC	Credit Pattern				Hours
				L	T	P	Tota	
FIRST SEMESTER								
1	BSMS18F1010	Functional English - I	CC	2	1	0	3	4
2	BSMS18F1020	Language – II: K / H / AE	CC	2	1	0	3	4
3	BSMS18F1030	Mathematics-I	HC	2	1	0	3	4
4	BSMS18F1040	Basic Statistics - I	HC	2	1	0	3	4
5	BSMS18F1050	Problem Solving Techniques using C	HC	2	1	0	3	4
6	BSMS18F1060	Constitution of India and Professional <i>Practicals</i>	FC	2	0	0	2	2
7	BSMS18F1070	Mathematics Lab - I	HC	0	0	2	2	3
8	BSMS18F1080	Basic Statistics Lab - I	HC	0	0	2	2	3
9	BSMS18F1090	C Programming Lab	HC	0	0	2	2	3
Total Credits				12	5	6	23	31
SECOND SEMESTER								
1	BSMS18F2010	Functional English - II	CC	2	1	0	3	4
2	BSMS18F2020	Language – II: K / H / AE	CC	2	1	0	3	4
3	BSMS18F2030	Mathematics-II	HC	2	1	0	3	4
4	BSMS18F2040	Basic Statistics - II	HC	2	1	0	3	4
5	BSMS18F2050	Data Structures Using C	HC	2	1	0	3	4
6	BSMS18F2060	Environmental Science	FC	2	0	0	2	2
7	BSMS18F2070	Sports/Yoga/music/dance/theatre <i>Practicals</i>	RULO	2	0	0	2	2
8	BSMS18F2080	Mathematics Lab - II	HC	0	0	2	2	3
9	BSMS18F2090	Basic Statistics Lab - II	HC	0	0	2	2	3
10	BSMS18F2100	Data Structures Lab	HC	0	0	2	2	3
Total Credits				14	5	6	25	33
THIRD SEMESTER								
1	BSMS18F3010	Communicative English - I	CC	2	1	0	3	4
2	BSMS18F3020	Language – II: K / H / AE	CC	2	1	0	3	4
3	BSMS18F3030	Mathematics-III	HC	2	1	0	3	4
4	BSMS18F3040	Statistical Inference - I	HC	2	1	0	3	4
5	BSMS18F3050	RDBMS	HC	2	1	0	3	4
6	BSMS18F3060	Classical Optimization <i>Practicals</i>	OE	4	0	0	4	4
7	BSMS18F3070	Mathematics Lab - III	HC	0	0	2	2	3
8	BSMS18F3080	Statistical Inference Lab - I	HC	0	0	2	2	3
9	BSMS18F3090	RDBMS Lab	HC	0	0	2	2	3
Total Credits				14	5	6	25	33
FOURTH SEMESTER								
1	BSMS18F4010	Communicative English - II	CC	2	1	0	3	4
2	BSMS18F4020	Language – II: K / H / AE	CC	2	1	0	3	4
3	BSMS18F4030	Mathematics-IV	HC	2	1	0	3	4
4	BSMS18F4040	Statistical Inference - II	HC	2	1	0	3	4

5	BSMS18F4050	Operating System & Shell Program Using LINUX	HC	2	1	0	3	4
6	BSMS18F4060	Soft Skill Training	RULO	1	1	0	2	3
		<i>Practicals</i>						
7	BSMS18F4070	Mathematics Lab - IV	HC	0	0	2	2	3
8	BSMS18F4080	Statistical Inference Lab - II	HC	0	0	2	2	3
9	BSMS18F4090	LINUX Lab	HC	0	0	2	2	3
		Total Credits		11	6	6	23	32
FIFTH SEMESTER								
1	BSMS18F5010	Mathematics-V	HC	1	1	0	2	3
2	BSMS18F5020	Mathematics-VI	HC	1	1	0	2	3
3	BSMS18F5030	Design and Analysis of Experiments	HC	1	1	0	2	3
4	BSMS18F5040	Sampling Theory	HC	1	1	0	2	3
5	BSMS18F5050	JAVA Programming	HC	1	1	0	2	3
6	BSMS18F5061	Complex Analysis	SC	2	0	0	2	2
	BSMS18F5062	Fluid Dynamics						
	BSMS18F5063	Number Theory						
7	BSMS18F5071	Statistical Quality Control(SQC)	SC	2	0	0	2	2
	BSMS18F5072	Reliability and Survival Analysis						
	BSMS18F5073	Data Mining						
8	BSMS18F5081	Web Programming	SC	2	0	0	2	2
	BSMS18F5082	Visual Programming						
	BSMS18F5083	Computer Graphics						
9	BSMS18F5090	Soft Skill Training	RULO	1	1	0	2	3
		<i>Practicals</i>						
10	BSMS18F5100	Design of Experiments Lab	HC	0	0	2	2	3
11	BSMS18F5200	JAVA Programming Lab	HC	0	0	2	2	3
12	BSMS18F5300	Web Programming Lab / Visual Programming Lab / Computer Graphics	HC	0	0	2	2	3
		Total Credits		12	06	06	24	33
SIXTH SEMESTER								
1	BSMS18F6010	Numerical Methods	HC	1	1	0	2	3
2	BSMS18F6020	Operations Research	HC	1	1	0	2	3
3	BSMS18F6030	Software Engineering	HC	1	1	0	2	3
4	BSMS18F6041	Fuzzy Mathematics	SC	2	0	0	2	2
	BSMS18F6042	Topology						
	BSMS18F6043	Discrete Mathematics and Graph Theory						
5	BSMS18F6051	Applied Statistics	SC	2	0	0	2	2
	BSMS18F6052	Econometrics						
	BSMS18F6053	Actuarial Statistics						
6	BSMS18F6061	Computer Networks	SC	2	0	0	2	2
	BSMS18F6062	Design and Analysis of Algorithms						
	BSMS18F6063	Computer Architecture						
7	BSMS18F6070	MOOC/SWAYAM/Internship	RULO	0	0	2	2	3
8	BSMS18F6080	Skill Development Courses	RULO	1	1	0	2	3
		<i>Practicals</i>						
9	BSMS18F6090	Mathematics-V Lab	HC	0	0	2	2	3
10	BSMS18F6100	Numerical Methods – Lab	HC	0	0	2	2	3
11	BSMS18F6200	Operations Research Lab	HC	0	0	2	2	3
12	BSMS18F6300	Computer Science Project Work	HC	0	0	2	2	3

		Total Credits		10	4	10	24	33
		Total Credits of all Semesters					144	195

Semester-wise Summary of Credit Distribution

Sem	CC	FC	HC	SC	OE	RULO	Total	L	T	P	Total	Total Hours
I	6	2	15	0	0	0	23	12	05	06	23	31
II	6	2	15	0	0	2	25	14	05	06	25	33
III	6	0	15	0	4	0	25	14	05	06	25	33
IV	6	0	15	0	0	2	23	11	06	06	23	32
V	0	0	16	6	0	2	24	12	06	06	24	33
VI	0	0	14	6	0	4	24	10	04	10	24	33
Total Credits	24	4	90	12	4	10	144	73	31	40	144	195

Detailed Syllabus

I - Semester

Sub Code: BSMS18F1010	Functional English - I	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

Course Objectives:

1. To 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 the course, students will be able to:

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

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F1010	CO1					3	3	3	1		
	CO2					3	3	3	2		
	CO3					3	3	3	2		
	CO4					3	3	3	1		

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

References:

Green, David. *Contemporary English Grammar Structures and Composition*. New Delhi: MacMillan Publishers, 2010.

Thorpe, Edgar and Showick Thorpe. *Basic Vocabulary*. Pearson Education India, 2012.

Leech, Geoffrey and Jan Svartvik. *A Communicative Grammar of English*. Longman, 2003.

Murphy, Raymond. *Murphy's English Grammar with CD*. Cambridge University Press, 2004.

Rizvi, M. Ashraf. *Effective Technical Communication*. New Delhi: Tata McGraw-Hill, 2005.

Riordan, Daniel. *Technical Communication*. New Delhi: Cengage Publications, 2011.

Sen et al. *Communication and Language Skills*. Cambridge University Press, 2015.

Sub Code: BSMS18F1020	Kannada - I	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives:

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

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

Learning Outcomes:

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

1. ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
2. ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
3. 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
BSMS18F1020	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		

Unit-I:

[12 Hrs]

1. ಸತ್ಯವಂತೆ ಹಡೆದವು - ಜನಪದಗೀತೆ
2. ನೆಲಸುಗೆ ನಿನ್ನ ವಕ್ಷದೊಳೆ - ಪಂಪ
3. ಕುಡು ಚಪಳೆ ಜಪದ ಮಣಿಯಂ - ನಾಗವರ್ಮ
4. ಚಿತ್ರಮಪಾತ್ರರಮತೆ ನಾರಿ - ಜನ್ನ

Unit-II:

[12 Hrs]

1. ಅಬ್ಬಿಯುಮೊರ್ಮೆ ಕಾಲವಶದಿಂ ಮರ್ಮಾದೆಯಂದಾಂಟದೇ.... - 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

ಪರಾಮರ್ಶನ 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 ದೇಶಿ 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

Sub Code: BSMS18F1020	Hindi - I	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

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 :

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

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

अधिगम परिणाम :

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
BSMS18F1020	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			

अध्ययन विषय सूची / पाठ्यक्रम

इकाई – 1: कहानी, संस्मरण

1. कहानी – नशा – प्रेमचंद
2. कहानी – सुखमय जीवन – चंद्रधर शर्मा गुलेरी
3. संस्मरण – शरत के साथ बिताया कुछ समय – अमृतलाल नागर

अध्यापन अवधियाँ : 12 hrs.

इकाई – 2: कहानी, आत्मकथा

4. कहानी – मरने से पहले – भीष्म साहनी
5. कहानी – लाल हवेली – शिवानी
6. आत्मकथा – जेल- झलक की जीवन - गणेश शंकर विद्यार्थी

अध्यापन अवधियाँ : 12 hrs.

इकाई – 3: कहानी, व्यंग्य रचना

7. कहानी – चाय का एक प्याला – कैथरीन मैन्सफील्ड
8. व्यंग्य रचना – भेड़े और भेड़ियें – हरिशंकर परसाई

अध्यापन अवधियाँ : 12 hrs.

इकाई – 4: अनुवाद, संक्षेपण

अनुवाद : अंग्रेज़ी – हिन्दी (शब्द एवं अनुच्छेद)

संक्षेपण : परिच्छेद का एक तिहाई भाग में |

अध्यापन अवधियाँ : 12 hrs.

सन्दर्भ ग्रन्थ :

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

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

Sub Code: BSMS18F1020	Additional English - I	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

Course Objectives:

To equip students with the ability to acquire the functional use of language in context.

To motivate the students to explore and critique issues related to society and Ethics.

To develop in the students a genuine 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 responsibilities in taking cognizance of issues relating to society and values.
2. Develop an understanding of literature in context.
3. Interpret and paraphrase their ideas logically and cohesively.
4. Illustrate the systems and ideologies inherent in the society.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F1020	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

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 SweetestRupert Brooke – Success

Dr. Martin Luther King - I Have a DreamHelen Keller – Excerpt from *The Story of My Life*

Writing Skills:Brochure &Leaflet

References:

Tagore, Rabindranath. *Gitanjali*. Rupa Publications, 2002.

Wordsworth, William. *The Complete Works of William Wordsworth*. Andesite Press, 2017.

Munro, Hector Hugh. *The Complete Works of Saki*. Rupa Publications, 2000.

Shakespeare, William. *The Complete Works of William Shakespeare*. Sagwan Press, 2015.

Chindhade, Shirish. *Five Indian English Poets: Nissim Ezekiel, A.K. Ramanujan, ArunKolatkhar, DilipChitre, R. Parthasarathy*. Atlantic Publications, 2011.

Dickens, Charles. *The Signalman and Other Horrors: The Best Victorian Ghost Stories of Charles Dickens: Volume 2*. Createspace Independent Publications, 2015.

Anderson, Hans Christian. *The Fir Tree*. Dreamland Publications, 2011.

Colvin, Sidney (ed). *The Works of R. L. Stevenson. (Edinburgh Edition)*. British Library, Historical Prints Edition, 2011.

Bishop, Elizabeth. *Poems*. Farrar, Straus and Giroux, 2011.

Swift, Jonathan. *Gulliver’s Travels*. Penguin, 2003.

Dickinson, Emily. *The Complete Poems of Emily Dickinson*. Createspace Independent Publications, 2016.

Brooke, Rupert. *The Complete Poems of Rupert Brooke*. Andesite Press, 2017.

King, Martin Luther Jr. &James M. Washington. *I Have a Dream: Writings And Speeches That Changed The World*. Harper Collins, 1992.

Keller, Helen. *The Story of My Life*. Fingerprint Publishing, 2016.

Green, David. *Contemporary English Grammar Structures and Composition*. New Delhi: MacMillan Publishers, 2010.

Thorpe, Edgar and Showick Thorpe. *Basic Vocabulary*. Pearson Education India, 2012.

Leech, Geoffrey and Jan Svartvik. *A Communicative Grammar of English*. Longman, 2003.

Murphy, Raymond. *Murphy’s English Grammar with CD*. Cambridge University Press, 2004

Sub Code: BSMS18F1030	Mathematics-1	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives:

To understand the concepts of algebra and its applications in various fields.
 To understand the concepts of solid geometry and its applications in various fields.
 To understand the concepts of differential calculus and its applications.
 To familiarize the concepts of integral calculus and its applications.

Course Outcomes:

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

1. Apply the matrix theory to solve the system of linear equations.
2. Apply Leibnitz theorem to find nth differentiation of functions.
3. Apply the knowledge of reduction formulae and differentiation under integral sign by Leibnitz rule to solve integral equations.
4. Solve problems on matrices, differential equations and definite integral equations by using SCI lab.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F1030	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

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 unknowns 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 differentiation, nth 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 theorem (with proof) and its application (problems).

Unit-III: Integral Calculus - 1

12 Hrs

Reduction formula for

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

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 :

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

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.

Krishnamoorty V K and Mainra V P and Arora J L, An Introduction to Linear Algebra, Reprint. New Delhi, India: Affiliated East West Press Pvt. Ltd., 2003.

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

Reference Books:

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

S. Narayanan & T. K. Manicavachogam Pillay, Calculus.: S. Viswanathan Pvt. Ltd., 1996, vol. I & II.

S.Narayanan and T.K.Manicavachogam Pillay, Calculus (I & II). Chennai, India: S. Viswanathan Pvt. Ltd., 1996.

Joseph Edwards, An elementary treatise on the differential calculus: with applications and numerous example, Reprint. Charleston, USA: BiblioBazaar, 2010.

Sub Code: BSMS18F1040	Basic Statistics-1	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives

To have the basic knowledge of collection and tabulation of data

To describe the univariate and bivariate data analysis

To understand the concepts of probability

To explore the basics of R software

Course Outcomes:The student will be able to

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

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F1040	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

Unit-I: 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-II: 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 andkurtosis: concept, measures, and properties.

Unit-III

12 hrs

Elements of probability: 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-IV

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

Goon, A.M., Gupta, M.K., and Das Gupta, B. (2017). *Fundamentals of Statistics, Vol. I*, World Press, Calcutta

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

W.J DeCoursey, Statistics and Probability for Engineering Applications, Elsevier Science (USA), 2009.

S.C Gupta and V.K Kapoor, Fundamentals of Mathematical Statistics, 11th Edn., (Reprint), Sultan Chand and Sons, 2007.

Miller, Irwin and Miller, Marylees, John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia, 2006.

Medhi, J. (1992). Statistical Methods: *An introductory Text*, New Age International, New Delhi.

Freund, J.E. and Walpole, R.E. (1987). Mathematical Statistics, 4/e, Prentice Hall Inc., New Jersey, USA.

Croxton, F.E, Cowden, D.J., and Klein, S. (1973). *Applied General Statistics*, 3/e, Prentice Hall Inc., New Jersey, USA.

References

Ross, S.M (2003). *Introduction to Probability Models*, 10/e, Academic Press, UK.

Cooke, H.D., Craven, A.H., and Clarke, G.M. (1982): *Basic Statistical Computing*, Chapman and Hall, New York.

Anderson, T.W. and Sclove , S.L. (1978). *An Introduction to the Statistical Analysis of Data*, Houghton Mifflin and Co, New York.

Mood, A.M., Graybill, F.A., and Boes, D.C. (1974): *Introduction to the Theory of Statistics*, McGraw Hill, New York.

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

Snedecor, G.W. and Cochran, W.G. (1967). *Statistical Methods*, Iowa State University Press, USA.

Spiegel, M.R. (1967). *Theory and Problems of Statistics*, Schaum's Publishing Series, London.

Sub Code: BSMS18F1050	Problem Solving Techniques using C	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

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:

To gain experience about structured programming
 To help students to understand the implementation of C language
 To understand various features in C language

Course Outcomes:

1. Understand the basic terminology used in computer programming
2. Write, compile and debug programs in C language.
3. Use different data types in a computer program.
4. Design programs involving decision structures, loops and functions and understand the dynamics of memory by the use of pointers.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F1050	CO1	3	3	3	3	2	0	1	3	3	3
	CO2	3	3	3	3	2	0	3	3	3	3
	CO3	3	3	3	2	2	0	2	3	3	3
	CO4	3	3	3	2	2	0	0	0	2	2

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

References 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 – B.A. Forouzan & R.F. Gillberg, THOMSON Indian Edition

Sub Code: BSMS18F1060	Indian Constitution &	L	T	P	C	CH
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Duration: 14 Weeks	Professional Ethics	2	0	0	2	2
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Course Objectives:

To provide and gain knowledge on Constitution of India.

To know and understand about the Fundamental Rights, Duties and other Rights which is been given by our law.

To prepare students in the understanding of Constitution perspective and make them face the world as a bonafide citizen.

To attain knowledge about ethics and also know about professional ethics.

Explore ethical standards followed by different companies.

Course Outcomes:

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

1. Strengthen the knowledge on Indian constitutional law and make the practical implementation of it.
2. Understand the fundamental rights and human rights.
3. Get the knowledge to explain the duties and more importantly practice it in a right way.
4. Adopt the habit of raising their voice against a unconstitutionality of any laws and upon any legal discrimination as we have session of debates on Constitutional validity.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F1060	CO1	3	3	2	2					2	3
	CO2	3	2	2	3					3	2
	CO3	3	2	3	2					3	2
	CO4	3	3	3	2					3	3

Unit -I:

6 Hrs

Constitution of India

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

Unit -II: Legislature and Executive

6 Hrs

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

Unit -III: Judiciary

6 Hrs

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

Unit-IV: Professional Ethics

6 Hrs

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

Text books:

M V Pylee, An introduction to Constitution of India

M Govindarajan, S Natarajan, V S Senthil Kumar, Engineering Ethics.

Dr. Durga Das Basu, Introduction to constitution of India

Sub Code: BSMS18F1070	Mathematics Lab - I	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

Prerequisites:

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

Course Objectives:

To understand the concepts of algebra and its applications in various fields.

To understand the concepts of solid geometry and its applications in various fields.

To understand the concepts of differential calculus and its applications.

To familiarize the concepts of integral calculus and its applications.

Course Outcomes:

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

1. Apply the matrix theory to solve the system of linear equations.
2. Apply Leibnitz theorem to find n^{th} differentiation of functions.
3. Apply the knowledge of reduction formulae and differentiation under integral sign by Leibnitz rule to solve integral equations.
4. Solve problems on matrices, differential equations and definite integral equations by using SCI lab.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F1070	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

Introduction to Sci lab
 Introduction to Sci lab commands connected with matrices
 Computation with matrices
 Raw reduad whelon from and normal form
 Establishing consistency or otherwise and solving system of linear equations
 Introduction to Maxima
 Introduction to Maxima commands for derivatives and nth derivatives
 n th derivative without Leibnitz rule
 n th derivative with Leibnitz rule
 maxima commands for reduction formula with or without limit
 Scilab and Maxima commands for plotting functions
 Solution of differential equations using suilab / Maxima and plotting the solution – I
 Solution of differential equations using scilab / Maxima and plotting the solution – II.

Sub Code: BSMS18F1080	Basic Statistics Lab - I	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

Prerequisites:

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

Course Objectives

- To have the basic knowledge of collection and tabulation of data
- To describe the univariate and bivariate data analysis
- To understand the concepts of probability
- To explore the basics of R software

Course Outcomes

The student will be able to

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

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F1080	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

(Demonstration of practicals using R-software)

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

Sub Code: BSMS18F1090	C Programming Lab	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

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
BSMS18F1090	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

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 palindrome or not.
- 5) Write a Program to find whether a given number is 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 subtractions of two matrices.
- 8) Write a C Program to read a string and check whether it is palindrome or not.
- 9) Write a Program to find the factorial of a number using 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).

II - Semester

Sub Code: BSMS18F2010	Functional English-II	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

Course Outline:

This is a 3 credit course for second semester consisting of 4 hours of teaching learning per week, inclusive of direct classroom teaching and practice in language lab.

Course Objectives:

To utilize the ability of using language skills effectively in real-life scenarios.

To develop the learners’ competence in employability skills.

To improve the habit of writing, leading to effective and efficient communication.

To prioritize specially on the development of technical reading and speaking skills among the learners.

Learning Outcomes:

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

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

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F2010	CO1					3	3	3	1		
	CO2					3	3	3	2		
	CO3					3	3	3	1		
	CO4					3	3	3	1		

Unit – I 12 Hrs

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

Unit – II 12 Hrs

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

Unit – III 12 Hrs

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

Unit – IV 12 Hrs

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

References:

- Bansal, R.K. and J.B. Harrison. *Spoken English*. Orient Blackswan, 2013.
Raman, Meenakshi and Sangeeta Sharma. *Technical Communication*. Oxford University Press, 2015.
Thorpe, Edgar and Showick Thorpe. *Objective English*. Pearson Education, 2013.
Dixon, Robert J. *Everyday Dialogues in English*. Prentice Hall India Pvt Ltd., 1988.
Turton, Nigel D. *ABC of Common Errors*. Mac Millan Publishers, 1995.
Samson, T. (ed.) *Innovate with English*. Cambridge University Press, 2010.
Kumar, E Suresh, J. Savitri and P Sreehari (ed). *Effective English*. Pearson Education, 2009.
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Sub Code: BSMS18F2020	Kannada-II	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives:

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

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

Learning Outcomes:

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

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

3. 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
BSMS18F2020	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		

Unit-I: ಮಧ್ಯಕಾಲೀನಕಾವ್ಯ

[12 Hrs]

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

Unit-II: ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯ

[12 Hrs]

1. ತ್ರಿಪದಿಗಳು - 'ವರ್ಜ್ಜ' ಹೆಳವನ
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 - 'ೋಹಿಯಾ
3. ಮಾನವೀಯತೆಅಂತಾರಲ್ಲಾ - ದೇವನೂರು ಮಹಾದೇವ
4. ಭೂತಾಯಿ ಮುನಿದಾಳು - ಮುರಾರಿ ಬಲ್ಲಾಳ

Unit-IV: ಪ್ರವಾಸಕಥನ

[12 Hrs]

ನನ್ನೊಳಗಿನ ಹಾಡುಕೂಬಾ - ಜಿ.ಎನ್. ಮೋಹನ್

ಪಠ್ಯಪುಸ್ತಕ ಗ್ರಂಥಗಳು :

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. 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. ಮರುಳಿಸಿದ್ದಪ್ಪ ಕೆ, ಷಟ್ಟದಿ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
8. ಸಂ. ಸೇತುರಾಮರಾವ್‌ಅ.ರಾ., ಶ್ರೀ ಲಕ್ಷ್ಮೀಶನಜೈಮಿನಿ ಭಾರತ(ಮೂಲ-ತಾತ್ಪರ್ಯ-ಸಚಿತ್ರ), ಪ್ರಕಾಶಕರುಕಾಮಧೇನು ಪುಸ್ತಕ ಭವನ, ಬೆಂಗಳೂರು. 2010
9. ಸಂ. ಜಿ.ಎಸ್.ಭಟ್., ಕುಮಾರವ್ಯಾಸನಕರ್ಣಾಟ ಭಾರತಕಥಾಮಂಜರಿ ಪ್ರವೇಶ, ಪ್ರಕಾಶಕರುಅಕ್ಷರ ಪ್ರಕಾಶನ, ಹೆಗ್ಗೋಡು, ಸಾಗರ. 2006
10. ಕೀರ್ತನಾಧಕುರ್ತಕೋಟಿ, 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

Sub Code: BSMS18F2020	Hindi-II	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives:

पाठ्यक्रम उद्देश्य :

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

अधिगम परिणाम :

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
BSMS18F2020	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			

अध्ययन विषय सूची / पाठ्यक्रम

इकाई – 1: प्राचीन कविता, आधुनिक कविता

1. कबीर के दोहे
2. कविता – जलियाँवाला बाग में बसंत- सुभद्राकुमारी चौहान
3. कविता – सुभाष की मृत्यु पर - धर्मवीर भारती

अध्यापन अवधियाँ : 12 hrs.

इकाई – 2: मध्यकालीन कविता, आधुनिक कविता

4. रसखान के दोहे
5. कविता – हमारी जिन्दगी - केदारनाथ अग्रवाल
6. कविता – चलना हमारा काम है।- शिवमंगल सिंह सुमन

अध्यापन अवधियाँ : 12 hrs.

इकाई – 3: मध्यकालीन कविता, आधुनिक कविता

7. मीराबाई के पद
8. कविता – मेरे सपने बहुत नहीं हैं- गिरिराज कुमार माथुर
9. कविता – अभी न होगा मेरा अंत – निराला

अध्यापन अवधियाँ : 12 hrs.

इकाई – 4: अनुवाद, निबंध

अनुवाद : हिन्दी – अंग्रेजी

निबंध :

1. भारत में किसानों की स्थिति
2. निर्वाचन आयोग का महत्व
3. प्रेस की आजादी कितनी सार्थक
4. भारतीय नारी
5. साहित्य का उद्देश्य

अध्यापन अवधियाँ : 12 hrs.

सन्दर्भ ग्रन्थ :

- पाठ्य पुस्तक – रेवा विश्वविद्यालय
सुबोध व्यवहारिक हिन्दी – डॉ. कुलदीप गुप्त
अभिनव व्यवहारिक हिन्दी – डॉ. परमानन्द गुप्त

हिन्दी साहित्य का इतिहास - डॉ. नागेन्द्र
 आधुनिक हिन्दी साहित्य का इतिहास - डॉ. बच्चन सिंह
 हिन्दी साहित्य का नवीन इतिहास - डॉ. लाल साहब सिंह
 शुद्ध हिन्दी कैसे बोले कैसे लिखे- पृथ्वीनाथ पाण्डे
 कार्यालय अनुवाद निदेशिका
 हिन्दी निबंध संग्रह

Sub Code: BSMS18F2020	Additional English-II	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

Course Objectives:

- To help the student understand the multiple values of the society.
- To develop a cultural understanding in the student to sharpen his/her social skills.
- To ensure a gradual development of literary interest in the student.

Course Outcomes:

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

1. Demonstrate a deep understanding of the society and its values.
2. Develop a constructive understanding of the cultural dimensions of the human world.
3. Make use of his understanding to become a responsible global citizen of tomorrow.
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
BSMS18F2020	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

Unit-I: Ecology & Environment

12 hrs

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

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

Degrees of Comparison

Unit-II: Voices from the Margin 12 hrs
 Literature: Tadeusz Rozewicz – Pigtail Jyoti Lanjewar – Mother Sowvendra Shekhar Hansda – The Adivasi Will Not Dance, Harriet Jacobs – Excerpt from *Incidents in the Life of a Slave Girl*
 Language: Prefix and Suffix

Unit-III: Women & Society 12 hrs
 Literature: Kamala Das – An Introduction, Usha Navrathnaram – To Mother ,Rabindranath Tagore – The Exercise Book, Jamaica Kincaid – Girl, Writing Skills: Dialogue Writing

Unit-IV: Popular Culture 12 hrs
 Literature: Rudyard Kipling – The Absent-minded Beggar, Sir Arthur Conan Doyle – The Hound of the Baskervilles, Aldous Huxley – The Beauty Industry, Writing Skills: Story Writing

References:

- Agrawal, K.A. *Toru Dutt the Pioneer Spirit of Indian English Poetry - A Critical Study*. Atlantic Publications, 2009.
 Latham, Edward Connery (ed). *The Poetry of Robert Frost*. Holt Paperbacks, 2002.
 Gale, Cengage Learning. *A Study Guide for Tomas Rivera's The Harvest*. Gale, Study Guides, 2017.
 Basu, Tejan Kumar. *The Life and Times of C.V. Raman*. PrabhatPrakashan, 2016.
 Rozewicz, Tadeusz. *New Poems*. Archipelago, 2007.

Sub Code: BSMS18F2030	Mathematics-II	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives

- The objective of this Course is to:
 Make the students learn fundamental concepts of groups.
 Develop the knowledge of differential calculus is essential for the students.
 Introduce fundamental theories of Laplace transforms.

Course Outcomes: By the end of the Course, Students shall be able to

1. Explain the classification of finitely generated abelian groups, subgroups.
2. Apply continuity and differentiability of a function at a point.
3. Apply Rolle's, Lagrange's mean value theorem to calculate the limit of a function using L'Hospital rule.

4. Solve the problems using SCILAB.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F2030	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

Unit – I: Group Theory-1

12 Hrs

Binary operation, algebraic structure-problems on finding identity and inverse. Definitions of semigroup and group, abelian group – problems on finite and infinite groups. Properties of group with proof – standard problems on groups – A finite semigroup with both the cancellation laws is a group – 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:

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

Topics in Algebra, I N Herstein, Wiley easter.

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

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

Reference Books:

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

S. Narayanan & T. K. Manicavachogam Pillay, Calculus: S. Viswanathan Pvt. Ltd., 1996, vol. I & II.

S.Narayanan and T.K.Manicavachogam Pillay, Calculus (I & II). Chennai, India: S. Viswanathan Pvt. Ltd., 1996.

Joseph Edwards, An elementary treatise on the differential calculus: with applications and numerous example, Reprint. Charleston, USA: BiblioBazaar, 2010.

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

Sub Code: BSMS18F2040	Basic Statistics -II	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives

To figure out the random variables using probability

To illustrate discrete and continuous probability distributions

To derive and demonstrate the limit theorems

Course Outcomes

The student will be able to

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
BSMS18F2040	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

Unit-I

12 Hrs

Univariate Random variable: 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-II

12 Hrs

Discrete probability distributions: Discrete uniform, Bernoulli, Binomial, Poisson, geometric, negative binomial, and hypergeometric 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-III

12 Hrs

Continuous probability distributions: Uniform, gamma, beta, exponential, Normal, and Cauchy distributions – mean, variance, moments, MGF, and properties

Unit-IV

12 Hrs

Bivariate random variables and limit theorems: 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

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

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

V.K Rohatgi and A.K Saleh Md. E. An Introduction to Probability and Statistics, 2nd Edn. (Reprint). John Wiley and Sons, 2009.

W.J DeCoursey, *Statistics and Probability for Engineering Applications*, Elsevier Science (USA), 2009.

AS Gaur and SS Gaur, *Statistical Methods for practice and Research: A guide to data analysis using SPSS*, 2nd Edition, Sage Publications Ltd, 2009.

S.C Gupta and V.K Kapoor, *Fundamentals of Mathematical Statistics*, 11th Edn., (Reprint), Sultan Chand and Sons, 2007.

Miller, Irwin and Miller, Marylees, John E. Freund's *Mathematical Statistics with Applications*, (7th Edn.), Pearson Education, Asia, 2006.

Gupta S.C and.Kapoor V.K: (2006). *Fundamental Mathematical Statistics*, Sultan Chand and Sons 88,Daryaganj , New Delhi.

Spiegel, M.R. (2001).*Probability and Statistics*, 4/e, Schaum's Outline Series, McGraw Hill, London.

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

Medhi, J. (1992).*Statistical Methods: An introductory text*, New Age International, New Delhi.

Goon A.M., Gupta, M.K., Das Gupta, B. (1991).*Fundamentals of Statistics*, Vol.I, World Press, Calcutta

References

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

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

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

Sub Code: BSMS18F2050	Data Structures using C	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives:

Assess how the choice of data structures and algorithm design methods.
 Choose the appropriate data structure and algorithm design method for a specified application.
 Write programs using function-oriented design principles.
 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
BSMS18F2050	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

Unit -I:

12 Hrs

Introduction and Overview: Definition of Data Structures, Elementary data organization, data structures operations, String Processing: Definition, Pointers, Storing Strings, String operations.
 Arrays: Definition, Linear arrays, Representation of Linear Arrays in Memory, Traversing Linear arrays, Inserting and deleting elements into arrays.

Unit - II:

12 Hrs

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

Stacks, Recursion, Towers of Hanoi, Implementation of recursive procedures by stack.

Unit - III: 12 Hrs
Queues – Definition, Array representation of queue, Linked list representation of queues Types of queue: Simple queue, Circular queue, Double ended queue, Priority queue, Operations on Queues. Linked list: Definition, Representation of Singly linked list in memory, Traversing a Singly linked list, Searching a Singly linked list, Insertion into a singly linked list, Deletion from a singly linked list.

Unit - IV: 12 Hrs
Doubly linked list, Header linked list, Circular linked list. Tree – Definitions, Binary trees, Representing binary trees in memory, Traversing binary trees. Graphs: Graph theory terminology, Sequential representation of Graphs: Adjacency matrix, traversing a Graph.

Text Book:

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

Reference Books:

Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 2013.

Robert Kruse, C.L.Tondo, Bruce Leung, ShashiMogalla, “Data Structures and Program Design using C”, Pearson Education, 2009.

Seymour Lipschutz, “Data Structures with C”, Schaum’soutLines, Tata McGraw-Hill, 2011.

Sub Code: BSMS18F2060	Environmental Studies	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

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

Course Objectives

- 1 Graduates will be familiar with current and emerging environmental trends and global issues, and have an understanding of ethical and societal responsibilities.
- 2 Graduates will have the ability to obtain the knowledge, and will recognize the need for engaging in life-long learning.
- 3 Will find the need of various types of energy(conventional & non-conventional) resources and natural resources.
- 4 Acquire knowledge with respect to biodiversity, threats, conservation and appreciate the concept of ecosystem.
- 5 Acquiring knowledge about environmental pollution-sources, effects and control measures of environmental pollution, degradation and waste management.
- 6 Explore the ways for protecting the environment.

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
BSMS18F2060	CO1	1	2	1	1	1	2	3	1	1	1
	CO2	1	3	1	1	1	3	3	1	1	1
	CO3	2	3	2	1	3	3	3	1	1	1
	CO4	1	2	1	1	1	2	3	1	1	1

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

BSMS18F2070	Sports/Yoga/Music/Dance/Theatre	L	T	P	C
Duration:14 Wks		2	0	0	2

Note: Music, Dance, and Theater courses are offered by the School of Performing Arts, whereas the Sports and Yoga courses are offered by the Department of Physical Education. The students 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, Veerabhadrasana.

Unit-III:

Asanas: Prone Position- Bhujangasana, Dhanurasana.

Asanas: Supine Position- Sarvangasana, Halasana.

Mudras- Dhyana mudra, , Namaste mudra, Nasika mudra

Unit-IV:

Pranayams:- Anuloma – Viloma, Basthrika, Bhramari.

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

B. VOLLEYBALL

Course Objectives:

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

The Art of the Indian Tabala – Srdjan Beronja.

Sub Code: BSMS18F2080	Mathematics Lab - II	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

Prerequisites:

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

Course Objectives

The objective of this Course is to:
 Make the students learn fundamental concepts of groups.
 Develop the knowledge of differential calculus is essential for the students.
 Introduce fundamental theories of Laplace transforms.

Course Outcomes: By the end of the Course, Students shall be able to

1. Explain the classification of finitely generated abelian groups, subgroups.
2. Apply continuity and differentiability of a function at a point and apply Rolle’s, Lagrange’s mean value theorem to Calculate the limit of a function using L’Hospital rule.
3. Compute the integrals of a function of two and three independent variables along with applications.
4. Apply the properties of Laplace transforms to solve ordinary differential equations and solve the problems using SCILAB.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F2080	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

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
 Plotting of standard Cartesian verves using scilab / maxima
 Plotting of standard Cartesian verves using scilab / maxima
 Plotting of standard parametric verves using scilab / maxima
 Plotting of standard polar verves using scilab / maxima
 Obtaing partial derivative of some standard function
 Verification of Euler's theorem and its extension
 Verification of jacobian

Sub Code: BSMS18F2090	Basic Statistics Lab -II	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

Prerequisites:

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

Course Objectives

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

Course Outcomes

The student will be able to

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

BSMS18F2090	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

(Demonstration using MS Excel and R software)

Univariate probability distributions: Expectation, moments, skewness, and kurtosis.

Bivariate probability distribution I: Moments and correlation coefficient.

Bivariate probability distribution II: Conditional expectation.

Applications of binomial distribution and fitting binomial distribution.

Applications of Poisson distribution and its fitting.

Computation of probabilities based on negative binomial, geometric, hyper geometric and discrete uniform distributions.

Applications of Normal distribution.

Fitting normal distribution.

Computation of probabilities based on rectangular and exponential distributions.

Applications of Chebyshev's inequality.

Sub Code: BSMS18F2100	Data Structures Lab	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

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
BSMS18F2100	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
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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).

III - Semester

Sub Code: BSMS18F3010	Communicative English - I	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

Course Objectives:

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

Learning 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
BSMS18F3010	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

Unit-I: Functional English

12 Hrs

Remedial Grammar: Past Simple; Past Continuous; Irregular Verbs, Writing Skills: Paragraph Writing, Activities: Conversations; Leaving Phone Messages, Literature: Chief Seattle – The End of Leaving and Beginning of Survival.

Unit-II: Interpersonal Skills

12 Hrs

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

Unit-III: Multi Tasking Skills

12 Hrs

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

Unit-IV: Communication Skills

12 Hrs

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

Sub Code: BSMS18F3020	Kannada - III	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

1. ಕನ್ನಡ ಭಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಅಗತ್ಯ.

2. ಭಾಷೆಯನ್ನು ಓದಲು ಮತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು.
3. ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು.

Course Objectives:

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

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

Learning Outcomes:

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

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

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F3020	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		

Unit I :ನವೋದಯ ಕವಿತೆಗಳು

[12 Hours]

1. ಮುದಿಯರಾಮಗೌಡ
2. ಬೆಳಗು
3. ಕಲ್ಕಿ
4. ಕನ್ನಡ್ ಪದಗೋಳ

- ಬಿ. ಎಂ. ಶ್ರೀ
- ದ.ರಾ. ಬೇಂದ್ರೆ
- ಕುವೆಂಪು
- ಜಿ. ಪಿ. ರಾಜರತ್ನಂ

Unit II :ಸವೋದಯ 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 ನಡೆದಾವಲ್ಲಾ | 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. ಕೀರ್ತನಾಧಿಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರುಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್‌ಟ್ರಸ್ಟ್, ಧಾರವಾಡ. 2009
6. ಸಂ. ಬಿ.ಎಸ್. ಕೇಶವರಾವ್. ಕೈಲಾಸಂ ಕನ್ನಡ ನಾಟಕಗಳು, ಪ್ರಕಾಶಕರುಅಂಕಿತ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2005
7. ಶಾಮರಾಯತ.ಸು., 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

Sub Code: BSMS18F3020	Hindi - III	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

- ಅध्येताको, हिन्दीनाटकसाहित्यकासंक्षिप्तज्ञानआवश्यकहै।
- हिन्दीसाहित्यकेइतिहासकासंक्षिप्तज्ञानकीआवश्यकताहै।
- हिन्दीव्याकरणकाअवबोधनआवश्यकहै।
- मीडियालेखनकीबुनियादीजानकारीचाहिए।

- अंग्रेज़ी-हिन्दी अनुवाद से संबंधित जानकारी जरूरी है।

पाठ्यक्रम उद्देश्य :

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

अधिगम परिणाम :

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
BSMS18F3020	CO1					2	3	2			
	CO2					2	2	3			
	CO3					3	3	3			
	CO4					3	2	3			

अध्ययन विषय सूची / पाठ्यक्रम

इकाई – 1: नाटक : द्रोणाचार्य और एक – डॉ. शंकर शेष
लेखक परिचय
प्रथम दृश्य
द्वितीय दृश्य

अध्यापन अवधियाँ : 12 hrs.

इकाई – 2: नाटक : द्रोणाचार्य और एक
तृतीय दृश्य
चतुर्थ दृश्य

अध्यापन अवधियाँ : 12 hrs.

इकाई – 3: नाटक : द्रोणाचार्य और एक
पंचम दृश्य
छठा दृश्य

अध्यापन अवधियाँ : 12 hrs.

इकाई – 4: अनुवाद, जनसंचार माध्यम
अनुवाद : अंग्रेजी - हिन्दी (समाचार पत्र से संबंधित)
जनसंचार माध्यम : स्वरूप, उद्भव और विकास |

अध्यापन अवधियाँ : 12 hrs.

सन्दर्भ ग्रन्थ :

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

Sub Code: BSMS18F3020	Additional English-III	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

Course Objectives:

To ensure the development of the linguistic prowess of the students.
To motivate the students to appreciate literature.
To promote an appreciable reading habit among the students.

Learning 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
BSMS18F3020	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

UNIT-I: Gender And Identity 12 Hrs
 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 12 hrs
 Alfred Noyes – The Highway Man, William Shakespeare – Sonnet 116, Frank Richard Stockton – The Lady or the Tiger?, Oscar Wilde – The Nightingale and the Rose, William Shakespeare – *Excerpt from Romeo and Juliet* (Balcony Scene)

UNIT-III: War & Trouma 12 Hrs
 Lord Alfred Tennyson – The Charge of the Light Brigade, Taufiq Rafat – The Medal Guy de Maupassant – Two Friends, Sadaat Hasan Manto – Toba Tek Singh, Bertolt Brecht – Excerpt from *Fear and Misery of the Third Reich*

UNIT-IV: Childrens’ Literature 12 Hrs
 William Wordsworth – Three Years She Grew in Sun and Shower, D.H. Lawrence – Discord in Childhood, Hans Christian Anderson – The Snow Queen, Anna Sewell – *The Black Beauty* (Extract) Rudyard Kipling – *The Jungle Book* (Extract)

References:

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

Sub Code: BSMS18F3030	Mathematics - III	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course objectives:

The Objectives of this course is to:

1. Develop the knowledge about the Groups and differential equations.
2. Solve Differential equations using different methods.
3. Illustrate about the application areas of Partial differentiation.

Course Outcomes

By the end of the Course, Students shall 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
BSMS18F3030	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

Unit-I: Group Theory – 2

12 Hrs

Normal Sub groups, homomorphism, isomorphism, Left Coset, Right Coset, Kernel of homomorphism. Sub groups – theorems on sub groups (With proof) Problems.

Unit-II: Differential Equation – 2

12 Hrs

Higher order linear differential equations, Solution of homogeneous linear differential equations of order n with constant coefficients. Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. Method of undetermined coefficients; Method of variation of parameters; Linear differential equations with non-constant coefficients; The Cauchy-Euler equation System of linear differential equations: Solution of a system of linear equations with constant coefficients.

Unit-III: Laplace Transformation

12 Hrs

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

Unit-IV: Inverse Laplace Transformation

12 Hrs

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

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

Text Books:

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

Topics in algebra , I N Herstein, Wiley easter.

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

Raisinghania M.D., Laplace and Fourier Transforms. New Delhi, India: S. Chand and Co. Ltd. , 1995,

Reference Books :

S Narayanan and T K Manicavachogam Pillay, Differential Equations.: S V Publishers Private Ltd., 1981.

Erwin Kreyszig, Advanced Engineering Mathematics, 8th ed. New Delhi, India: Wiley India Pvt. Ltd., 2010.

Murray R, Spiegel L: Laplace Transforms (Schaum Series).

Sub Code: BSMS18F3040	Statistics Inference-I	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives

To characterize the sampling distributions

To classify the different techniques of point estimation for estimating the parameter values

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
BSMS18F3040	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

Unit-I

12 hrs

Sampling distributions: 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-II

12 hrs

Point estimation I: 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-III

12 hrs

Point estimation II: 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-IV

12 hrs

Interval estimation and simulation: 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

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

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

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

Spiegel, M.R. (2001).*Probability and Statistics*, 4/e, Schaum's Outline Series, McGraw Hill, London.

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

Medhi, J. (1992).*Statistical Methods: An introductory text*, New Age International, New Delhi.

Goon A.M., Gupta, M.K., Das Gupta, B. (1991).*Fundamentals of Statistics*, Vol.I, World Press, Calcutta.

References

Ross, S.M (2003). *Introduction to Probability Models*, 10/e, Academic Press, UK.

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

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

Casella, G. and Berger, R.L. (1990). *Statistical Inference*, Duxbury Press, Belmont, California, USA. (2nd Edition).

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

Sub Code: BSMS18F3050	RDBMS	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives:

Learn and practice data modelling using the entity-relationship and developing database designs.

Design and implement a database schema for a given problem-domain

Apply normalization techniques to normalize the database

Understand the use of Structured Query Language (SQL) and learn SQL syntax.

Course Outcomes:

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
BSMS18F3050	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

Unit – I:

12 Hrs

Introduction: Database and Database Users, Characteristics of the Database Approach, Different people behind DBMS, Implications of Database Approach, Advantages of using DBMS, When not to use a DBMS. Database System Concepts and architecture: Data Models, Schemas, and Instances. DBMS Architecture and Data Independence., Database languages and interfaces. The database system Environment, Classification of DBMS.

Unit - II:

12 Hrs

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

Unit - III:

12 Hrs

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

Unit – IV: 12 Hrs
 Relational Database Language: DL and DML in SQL: DDL commands - create table/views/index, drop, alter, DML commands – select, insert, delete, update, etc., DCL commands – grant, revoke, commit, TCL commands, SQL – query, sub-query, nested query, Joins – natural, inner, outer join, aggregate functions in SQL.

Text Book:

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

Reference Books:

Abrahamsi. Silberschatz, Henry. F. Korth, S. Sudarshan, “Database System Concepts” 6th Edition, McGraw Hill, 2012.

C.J.Date, “Introduction to database systems”, Eight Edition, Addison Wesley .

Sub Code: BSMS18F3060	Classical Optimization	L	T	P	C	CH
Duration: 14 Weeks		4	0	0	4	4

Prerequisites:

Knowledge of function, continuous function differentiable function and differential calculus

Course objectives:

The objective of this course is to make students to learn principles of optimization, To implement the optimization Concepts for the structural engineering problems. To evaluate different methods of optimization.

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
BSMS18F3060	CO1	3	2	2	2					2	3
	CO2	3	2	2	2					3	2
	CO3	3	2	2	2					3	3

	CO4	3	3	2	2					2	3
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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

Sub Code: BSMS18F3070	Mathematics Lab - III	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

Prerequisites:

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

Course objectives:

The Objectives of this course is to:

1. Develop the knowledge about the Groups and differential equations.
2. Solve Differential equations using different methods.
3. Illustrate about the application areas of Partial differentiation.

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
BSMS18F3070	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

Lab Experiments

- To verify whether given subgroup it is a normal subgroup of a group G
- To verify a given fraction homomorphism of group G to G^{-1}
- To verify a given onto homomorphism of group G to G^{-1} is isomorphism or not.
- To verify Lagrange's theorem.
- To find left and right coset (examples)
- To find the solution to the differential equation
- To find the Laplace transform of given function
- To find the inverse Laplace Transform of given function
- To solve ODE Using Laplace Transform.
- To find the solution to the differential equation.

Sub Code: BSMS18F3080	Statistical Inference lab - I	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

Prerequisites:

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

Course objectives

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

Course outcomes

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

1. 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
BSMS18F3080	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)

Drawing random samples using random number tables .

Application of the central limit theorem.

Point estimation of parameters and obtaining estimates of standard errors.

Comparison of estimators by plotting mean square error.

Computing maximum likelihood estimates -1

Computing maximum likelihood estimates - 2

Computing moment estimates

Constructing confidence intervals based on large samples.

Constructing confidence intervals based on small samples.

Generating random samples from discrete and continuous distributions.

Text Book

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

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

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

Spiegel, M.R. (2001).*Probability and Statistics*, 4/e, Schaum's Outline Series, McGraw Hill, London.

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

Medhi, J. (1992).*Statistical Methods: An introductory text*, New Age International, New Delhi.

Goon A.M., Gupta, M.K., Das Gupta, B. (1991).*Fundamentals of Statistics*, Vol.I, World Press, Calcutta.

References

Ross, S.M (2003). *Introduction to Probability Models*, 10/e, Academic Press, UK.

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

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

Casella, G. and Berger, R.L. (1990). *Statistical Inference*, Duxbury Press, Belmont, California, USA. (2nd Edition).

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

Sub Code: BSMS18F3090	RDBMS Lab	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

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
BSMS18F3090	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

LabExperiments

PART – A

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

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

- i) Create the above table.
- ii) Remove the existing attributes from the table.
- iii) Change the data type of regno from integer to string.
- iv) Add a new attribute phoneno to the existing table.

- v) Enter five tuples into the table.
- vi) Display all the tuples in student table.

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

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

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

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

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

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

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

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

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

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

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

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

- i) Create the above tables by properly specifying the primary keys and the foreign keys
- ii) Enter at least five tuples for each relation.
- iii) Demonstrate how you
 - a) Update the damage amount for the car with a specific regno in the accident with report no 12 to 25000.
 - b) Add a new accident to the database.
- iv) Find total number of people who owned cars that were involved in accidents in 2002
- v) Find the number of accidents in which cars belonging to a specific model were involved

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

STUDENT(regno: string, name: string, branch: string, bdate: date)
COURSE(course-no: int, cname: string, dept: string)
ENROLL(reg-no: string, course-no: int, sem: int, marks: int)
BOOK-ADOPTION(course-no: int, sem: int, book-isbn: int)
TEXT(book-isbn: int, book-title: string, publisher: string, author: string)

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

6. The following tables are maintained by a book dealer

AUTHOR(author-id: int, name: string, city: string, country: string)
PUBLISHER(publisher-id: int name: string, city: string, country: string)
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, banch-name: string, balance: real)
DEPOSITOR(customer-name: string, accno: int)
CUSTOMER(customer-name: string, customer-street: string, customer-city: string)
LOAN(loan-no: int, branch-name: string, amount: real)
ORROWER(customer-name: string, loan-no: int)

- i) Create the above tables by properly specifying the primary keys and foreign keys.
- ii) Enter atleast five tuples for each relation.
- iii) Find all the customers who have atleast two accounts at the main branch.
- iv) Find all customer who have an account at all the branches located in a specific city.
- v) Demonstrate how t0 delete all account tuples at every branch located in specific city.

8. Consider the following database for ORDER PROCEEESING.

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).

IV - Semester

Sub Code: BSMS18F4010	Communicative English-II	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

Course Objectives:

To prepare the students to become successful professionals by enhancing their communicative skills.

To develop the grammatical base of the students which would serve them in the long run.

To equip the students to form a strong command over vocabulary.

Learning Outcomes:

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

1. Develop professional communicative skills.
2. Apply their acquired grammatical knowledge in broader spheres of linguistic usage.
3. Utilize their communicative skills in multiple arenas of practical existence.
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
BSMS18F4010	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

Unit-I: Language Acquisition

12 Hrs

Remedial Grammar: Questions & Negatives; Questions Tags, Writing Skills:

Email Writing, Activities: Group Discussions, Literature: Alphonse Daudet - The Last Lesson

Unit-2 : Persuasive Skills

12 Hrs

Remedial Grammar: Past Simple & Past Perfect, Writing Skills: Report Writing Activities:

Book & Movie Reviews, Literature: Lord Alfred Tennyson - Ulysses

Unit-III: Cognitive Skills

12 Hrs

Remedial Grammar: Present & Past Passive; Conditionals, Writing Skills: Creative Writing

Activities: Role Plays, Literature: O. Henry – The Gift of the Magi

Unit-IV: Employability Skills

12 Hrs

Remedial Grammar: Reported Speech; Idioms, Writing Skills: Cover Letter & CV Activities:

Exchanging Information, Literature: Saki – The Open Window

References:

Bansal, R.K. and J.B. Harrison. *Spoken English*. Orient Blackswan, 2013.

Raman, Meenakshi and Sangeeta Sharma. *Technical Communication*. Oxford University Press, 2015.

Thorpe, Edgar and Showick Thorpe. *Objective English*. Pearson Education, 2013.

Dixon, Robert J. *Everyday Dialogues in English*. Prentice Hall India Pvt Ltd., 1988.

Turton, Nigel D. *ABC of Common Errors*. Mac Millan Publishers, 1995.

Samson, T. (ed.) *Innovate with English*. Cambridge University Press, 2010.

Kumar, E Suresh, J. Savitri and P Sreehari (ed). *Effective English*. Pearson Education, 2009.

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

Sub Code: BSMS18F4020	Kannada - IV	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives:

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

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

Learning Outcomes:

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

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

- ಸಾಮಾಜಿಕ ಅರಿವು ಮೂಡಿಸುತ್ತದೆ.
- ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F4020	CO1					2	3				
	CO2					2	3				
	CO3						3				
	CO4							3	2		

Unit Iನವ್ಯ-ಸ್ವೀವಾದಿ 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 | ಧ್ವಲಿಂಗಯ |
| 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 ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರುಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸೀಮಾಂತಿಕ 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. ಆಮೂರ, ಕನ್ನಡಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
8. ಕೀರ್ತನಾಧಿಕಾರಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರುಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್‌ಟ್ರಸ್ಟ್, ಧಾರವಾಡ. 2009
9. ಶಾಮರಾಯತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು -2014

कवि परिचय

प्रथम सर्ग

द्वितीय सर्ग

इकाई – 2: खंड काव्य – संशय की रात

तृतीय सर्ग

चतुर्थ सर्ग

इकाई – 3: खंड काव्य – संशय की रात

पंचम सर्ग

छठा सर्ग

सप्तम सर्ग

अध्यापन अवधियाँ : 12 hrs.

अध्यापन अवधियाँ : 12 hrs.

इकाई – 4: व्याकरण : अलंकार , सिनिमा रिब्यू

hrs.

व्याकरण : अलंकार

सिनिमा रिब्यू :

दंगल , सत्याग्रह , मीडियम हिन्दी और चेक दे इंडिया ।

अध्यापन अवधियाँ : 12

सन्दर्भ ग्रन्थ :

संशय की एक रात – नरेश मेहता

हिन्दी साहित्य का इतिहास - डॉ. नागेन्द्र

आधुनिक हिन्दी साहित्य का इतिहास - डॉ. बच्चन सिंह

हिन्दी साहित्य का नवीन इतिहास - डॉ. लाल साहब सिंह

शुद्ध हिन्दी कैसे बोले कैसे लिखे- पृथ्वीनाथ पाण्डे

भारतीय संस्कृति के आधार - विद्यानिवास मिश्रा

रामायण की कहानियाँ - हर्षा शर्मा

रस छंद और अलंकार - कृष्णदेव शर्मा और सुरेश अग्रवाल

Sub Code: BSMS18F4020	Additional English-IV	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills.

Course Objectives:

To introduce the students to the multiplicity of literature from all over the world.

To contribute in the emotional and social development of the students.

To develop in the students an ability to appreciate cultural and social diversity.

Learning Outcomes:

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

1. Demonstrate a visible understanding of the significant issues of the society.
2. Summarize the basic as well as the latent concepts of the texts provided in the syllabus and do justice to them.
3. Explain the major and minor themes of the select texts and their significance in the broader context of real life.
4. Develop reading skills and vocabulary range

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F4020	CO1					3	3	3	2		
	CO2					3	3	3	3		
	CO3					3	3	3	2		
	CO4					3	3	3	2		

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*

References:

Finneran, Richard J. *The Collected Works of W.B. Yeats*(Volume I: The Poems: Revised Second Edition). Simon & Schuster, 1996.

Pattanaik, Devdutt. *Shikhandi: And Other 'Queer' Tales They Don't Tell You*. Penguin Books, 2014.

Karve, Irawati. *Yuganta: The End of an Epoch*. Orient Blackswan, 2007.

Ezekiel, Nissim. *Collected Poems* (With A New Introduction By John Thieme). OUP, 2005.

Hughes, Langston. *The Collected Poems of Langston Hughes*. Vintage, 1995.

Chopin, Kate. *The Awakening and Selected Stories of Kate Chopin*. Simon & Schuster, 2004.

Ibsen, Henrik. *A Doll's House*. Maple Press, 2011.

Poe, Edgar Allan. *The Complete Poetry of Edgar Allan Poe*. Penguin USA, 2008.

Stoker, Bram. *Dracula*. Fingerprint Publishing, 2013.

Ray, Satyajit. *The Complete Adventures of Feluda* (Vol. 2). Penguin Books Ltd., 2015.

Lama, Dalai. *Freedom In Exile: The Autobiography of the Dalai Lama of Tibet*. Little, Brown Book Group, 1998.

Murthy, Sudha. *Wise and Otherwise: A Salute to Life*. Penguin India, 2006.

Washington, Booker T. *Up from Slavery*. Infinity, 2015.

Sub Code: BSMS18F4030	Mathematics-IV	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

Differentiation, integration, basic concepts of arithmetic and algebra.

Course Objectives:

The main objective of the Course is to:

Introduce the basic concepts of abstract algebra.

Have exposure to create and represent the sequences.

Familiarize with the series of real numbers and its nature.

Introduce different methods of analytical solutions to higher order linear ODE's.

Course Outcomes:

At the End of the Course, student shall be able to:

1. Explain the fundamental concepts of abstract algebra such as rings, fields and their role in modern mathematics and applied contexts.
2. Identify different types of sequences, define limit of a sequence and the Cauchy criterion.
3. Define and recognize the series of real numbers and their nature like convergence, divergence, oscillatory by different Tests.
4. Identify a given higher order Linear Ordinary differential equations and to apply different analytical methods to find the solution.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F4030	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

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

Unit-IV: Vector Calculus – 1 12 Hrs
 Velocity, Acceleration, Angle between two vectors, Tangential normal vector, Gradient, Divergence of a scalar point function and curl of a vector point function directional derivative, unit normal to a

surface, Solenoidal and irrotational vectors – physical interpretation of divergence and curl of a vector point function.

Text Books :

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

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

Reference Books :

S Narayanan & Manicavachogam Pillay, Vector Algebra and Analysis, 4th ed.: S V Publishers, 1986.

Raisinghania Md, Saxena Hc, and Dass Hk, Simplified course in Vector Calculus, 1st ed. New Delhi, India: S.Chand and Company Ltd., 2002.

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

Sub Code: BSMS18F4040	Statistics Inference-II	L	T	P	C	CH
Duration: 14 Weeks		2	1	0	3	4

Prerequisites:

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

Course Objectives

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:

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
BSMS18F4040	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

Unit-I

12 Hrs

Introduction to tests of hypotheses: 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-II

12 Hrs

Tests of significance I: 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-III

12 Hrs

Tests of significance II: 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-IV

12 Hrs

Nonparametric tests: Introduction to nonparametric tests. Run test for randomness. Sign test and Wilcoxon on 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

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

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

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

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

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

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

References

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

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

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

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

Sub Code: BSMS18F4050	Operating Systems & Shell	L	T	P	C	CH
Duration: 14 Weeks	Programming Using LINUX	2	1	0	3	4

Prerequisites:

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

Course Objectives:

Enabling Knowledge: the operation, implementation and performance of modern operating systems, and the relative merits and suitability of each for complex user applications

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
 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
 To become familiar with the various commands of the Linux.
 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	P02	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F4050	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

Unit-I

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

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

Unit-III

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

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

A. Silberschatz, P.B. Galvin and G. Gagne, *Operating System Concepts*.8th Edn, New Delhi: Wiley India, 2011.

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

Sub Code: BSMS18F4070	Mathematics Lab - IV	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

Prerequisites:

Differentiation, integration, basic concepts of arithmetic and algebra.

Course Objectives:

The main objective of the Course is to:

Introduce the basic concepts of abstract algebra.

Have exposure to create and represent the sequences.

Familiarize with the series of real numbers and its nature.

Introduce different methods of analytical solutions to higher order linear ODE's.

Course Out Comes:

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
BSMS18F4070	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

To verify continuity of a function

Evaluation of limits y 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

Sub Code: BSMS18F4080	Statistical Inference Lab - II	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

Prerequisites:

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

Course Objectives

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:

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
BSMS18F4080	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

(Demonstration of practicals using MS-Excel)

Evaluation of probabilities of Type-I and Type-II errors and powers of tests.

MP test for parameters of binomial and Poisson distributions.

MP test for the mean of a normal distribution and power curve.

Tests for mean, equality of means when variance is (i) known, (ii) unknown under normality (small and large samples)

Tests for single proportion and equality of two proportions.

Tests for variance and equality of two variances under normality

Tests for correlation and regression coefficients.

Tests for the independence of attributes, analysis of categorical data and tests for the goodness of fit. (For uniform, binomial and Poisson distributions)

Nonparametric test I (Test for randomness, sign tests)

Nonparametric test II (Two sample tests)

Sub Code: BSMS18F4090	LINUX Lab	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

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

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F4090	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

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 C program 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. 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).

V - Semester

Sub Code: BSMS18F5010	Mathematics - V	L	T	P	C	CH
Duration: 14 Weeks		1	1	0	2	3

Prerequisites:

Knowledge of trigonometry, geometry and calculus.

Course Objectives: Students who take this course will be able to:

Interpret derivatives of vector valued functions as velocity and acceleration functions.

Learn to evaluate multiple integrals.

Explain the definition and properties of vector space and its base.

State the linear transformation and find range, image, rank and nullity of the given transformation.

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
BSMS18F5010	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

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, 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 :

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.

Reference Books :

Erwin Kreyszig, Advanced Engineering Mathematics, 8th edn. New Delhi, India: Wiley India Pvt. Ltd., 2010.

S Narayanan & M Pillay, Vector Algebra and Analysis, 4th ed.: SV Publisher, 1986.

10. Raisinghania Md, Saxena Hc, and Dass Hk, Simplified course in Vector Calculus, 1st ed. New Delhi, India: S.Chand and Company Ltd., 2002.

Sub Code: BSMS18F5020	Mathematics - VI	L	T	P	C	CH
Duration: 14 Weeks		1	1	0	2	3

Prerequisites:

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

Course Objectives: Student shall be able to

Solve linear Partial Differential Equations with different methods.

Use computational tools to solve problems and applications of Partial Differential Equations.

Understand the calculus of variation with the problem of extremizing “functionals”. One of the objectives of a course is to prepare students for future courses in their areas of specialization for solving practical problems

Find the Fourier series of periodic functions

Course Outcomes: By the end of the Course, Students shall be able to

1. Solve linear partial differential equations of both first and second order.
2. Familiarize with partial differential equations, and its applications to standard problems like Heat, Wave and Laplace.
3. solve simple initial and boundary value problems and isoperimetric problems by using several variable calculus;
4. Obtain the complex exponential Fourier series of a function and know how the complex Fourier coefficients are related to the Fourier cosine and sine coefficients.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F5020	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

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:

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

Reference Books:

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

Sub Code: BSMS18F5030	Design and Analysis of Experiments	L	T	P	C	CH
Duration: 14 Weeks		1	1	0	2	3

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

- To equip the students with the basic concepts, theory and applications of ANOVA technique
- To guide the students to understand the concepts, issues and principles of design of experiments.
- To construct a good designs for different practical experiments.
- 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
BSMS18F5030	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

Unit 1

Analysis of variance: 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. 9 hrs

Unit2

Experimental designs: 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. 9 hrs

Unit3

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

Unit4

Factorial experiments: 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. 9hrs

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.

References

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.

Sub Code: BSMS18F5040	Sampling Theory	L	T	P	C	CH
Duration: 14 Weeks		1	1	0	2	3

Prerequisites:

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

Course Objectives

To describe the concepts of sampling theory
To compare the various techniques of sampling.

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
BSMS18F5040	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

Unit-I

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 system, use of random numbers.

Unit-II

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.

Unit-III 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.

Unit-IV 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

Text Books

Goon A.M., Gupta, M.K., Das Gupta, B. (1991). *Fundamentals of Statistics*, Vol. I, World Press, Calcutta.

Cochran, W. G. (2007). *Sampling Techniques*. 3/e, John Wiley and Sons, New York.

Mukhopadhyay, P (1996). *Applied Statistics*. Calcutta Publishing House

References

Des Raj and Chandok, P. (1998). *Sampling Theory*, Narosa, New Delhi.

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

Murthy, M.N. (1977). *Sampling Theory and Methods*, Statistical Publishing Society, Calcutta.

Sampath, S. (2006). *Sampling Theory and Methods*, 2/e, Narosa, New Delhi.

Sub Code: BSMS18F5050	Java Programming	L	T	P	C	CH
Duration: 14 Weeks		1	1	0	2	3

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:

Able to understand the four pillars of Object orientation.

Understand the concepts of classes and objects.

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
BSMS18F5050	CO1	3	2	3	2	3	1		2	3	3
	CO2	2	1	3	1	2		2	3	3	2
	CO3	2	1	3		1		3	1	2	3
	CO4	3	2	3	2	3	1		2	3	3

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 Books

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.

Sub Code: BSMS18F5061	Complex Analysis	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Knowledge of linear algebra, differential equation and real analysis

Course Objectives:

This course concerns the complex analysis and applications of line integrals, Cauchy's inequality and Residue theorem.

Course Outcomes:

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
BSMS18F5061	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

Unit-I: Complex Analysis – 1

6 Hrs

Expression of sine and cosines using De-Moiver's theorem. Series of sines and cosines. Hyperbolic functions. Logarithm of a complex number (Simple examples) Summation of trigonometric series (simple problems).

Unit-II: Complex Analysis – 2

6 Hrs

Recapitulation of Complex numbers, the complex plane, conjugate and modulus of a complex number. The polar form, geometrical representation, Euler's formula. Functions of complex variables: Limit, continuity and differentiability.

Unit-III: Complex analysis – 3

6 Hrs

Analytic functions, Cauchy-Reimann equations in Cartesian and polar forms. Sufficient conditions for analyticity (in Cartesian form). Real and imaginary parts of analytic function which are harmonic. Construction of analytic function, given real and imaginary parts.

Unit-IV: Complex analysis – 4

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 integral theorem (statement) and its consequences. The Cauchy's integral formulae for the function and derivatives. Applications to the evaluation of simple line integrals. Cauchy's inequality. Liouville's theorem-Fundamental theorem of algebra Residue theorem with examples.

Text Books/open source materials

S Shanthinarayan, Complex Analysis, S Chand Co. Pvt. Ltd., 2012.

R V Churchill & J W Brown, Complex Variables and Applications, 5th ed. TMH 1989.

L V Ahlfors, Complex Analysis, 3rd ed.: Mc Graw Hill. , 1979.

A R Vashista, Complex Analysis, Krishna Prakashana Mandir, 2012.

Richard R Goldberg, Methods of Real Analysis, Indian ed. New Delhi, India: O&IBH Publishing Co. 1970.

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

Suggested Web links:

1. <http://www.math.unl.edu/~webnotes/contents/chapters.htm>

2. <http://www-groups.mcs.st-andrews.ac.uk/~john/analysis/index.html>

3. <http://web01.shu.edu/projects/reals/index.html>

4. <http://www.mathcs.org/analysis/reals/index.html>

Sub Code: BSMS18F5062	Fluid Dynamics	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Knowledge of calculus and intermediate physics

Course Objectives:

The students will learn to:

Explain the relative angular velocity, acceleration, rectilinear motion, work, power and energy.

State projectile, trajectory and inclined plane.

Explain conservation of linear momentum, impact of the sphere.

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
BSMS18F5062	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

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

Unit-II 06 Hrs
 Motion of a projectile, Nature of a trajectory, Results pertaining to the motion of a projectile, Range on an inclined plane, Maximum range on the inclined plane. Simple problems.

Unit-III 06 Hrs
 Impulsive force, Conservation of linear momentum, Impact of a sphere, Laws of impact, Impact of two smooth spheres, Direct impact of two smooth spheres, Direct impact of a smooth sphere on a plane, oblique impact of a smooth sphere on a plane. Simple problems.

Unit-IV 06 Hrs
 Central force and Central Orbit, Equation of central orbit, finding law of force and speed for a given orbit, Determination of the orbit when law of force is given, Kepler's Laws on planetary motion. Simple Problems. Moment of Inertia of simple bodies, Theorems of parallel and perpendicular axes, Moment of inertia of triangular lamina, circular lamina, circular ring, right circular cone, sphere. Simple problems.

Text Books:

An Introduction to Fluid dynamics by G K Batchelor, Cambridge University Press.
 Elementary Fluid Dynamics by D J Acheson, Clarendon Press.

Reference Books:

Fluid Dynamics an introduction by Rieutord, Michel, Springer Publications
 Physical Fluid Dynamics by D J Tritton
 A First Course in Fluid Dynamics by A R Paterson, Cambridge University Press.

Sub Code: BSMS18F5063	Number Theory	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Knowledge of abstract algebra and commutative algebra.

Course Objectives

- To understand the theory of congruence's.
- To understand the functions of several variables.
- To familiarize with graphs.
- To familiarize with the concept of limits and continuity in higher dimensions.

Course Outcomes:

The student shall be able to

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

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F5063	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

Unit-I 06 Hrs
 The Theory of Congruence's, Properties of Congruence's, Binary and Decimal representation of integers, Linear Congruence's and the Chinese Remainder theorem. Fermatas Theorem, Wilson's Theorem, Euler's Phi-Function, Euler's Theorem, Some properties of Phi-Function, Finite continued fractions.

Unit-II 06 Hrs
 Functions of several variables: Definition of function of n independent variables, Domains and ranges, Functions of 2 variables, Definition of interior and boundary points, Definitions of open, closed, bounded and unbounded regions in a plane.

Unit-III 06 Hrs
 Graphs, level curves, and contours of functions of 2 variables, Level curves, graph, surface, Functions of three variables, Level surface, Interior and boundary points for space regions, open and closed regions.

Unit-IV 06 Hrs
 Limits and continuity in higher dimensions: Limits and continuity. Two path test for non-existence of limit, continuity of composites, Functions of more than two variables, Extreme values of continuous functions on closed and bounded sets.

Text Books:

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

Elementary Number theory by David M Burton, 6th Edition-Tata McGraw Hill

Reference Books:

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

Sub Code: BSMS18F5071	Statistics Quality Control	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Knowledge of summarizing and descriptive statistics, plotting graph.

Course Objectives

To blueprint the protocol used in SQC

To optimize the control charts for variables and attributes

To diagnose the sampling plans for product control

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
BSMS18F5071	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

Unit-I

06 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-II

06 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-III

06 Hrs

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

Unit-IV

06 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

Montgomery, D.C. (2013). *Introduction to Statistical Quality Control*, (Wiley Int. Edn.)

Goon A.M., Gupta, M.K., Das Gupta, B. (1991). *Fundamentals of Statistics*, Vol. I, World Press, Calcutta.

Mahajan, M. (2001). *Statistical Quality Control*, Dhanpat Rai & Co. (P) Ltd. New Delhi.

Grant, E.L. and Leavenworth, R. S. (1996). *Statistical Quality Control*. 7th edition, McGraw Hill, New York.

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.

Sub Code: BSMS18F5072	Reliability and Survival Analysis	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

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

Course Objectives

- To introduce the concepts and measures of reliability and reliability of systems.
- To identify the characteristics of survival data and their implications for the analysis.
- To study inference of survival data under censoring.

Course outcomes

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

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

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F5072	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

Unit 1

06 hrs

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

Unit 2

06 hrs

Survival analysis: Survival functions, hazard rate, cumulative hazard function, residual lifetime, 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 06 hrs
 Notions of aging: IFR, IFRA, NBU, DMRL, NBUE, and HNBUE classes; their duals. Aging properties of common life time distributions.

Unit 4 06 hrs
 Censoring: Concept of censoring, various types of censoring, Estimation and Testing of parameters of exponential distribution under various types of censoring.

Text Books

Jayant V Deshpande, Sudha G Purohit (2015), Life Time Data: Statistical Models and Methods, Word Scientific.

Vincent Couallier, Léo Gerville-Réache, Catherine Huber-Carol, Nikolaos Limnios, Mounir Mesbah (2013) Statistical Models and Methods for Reliability and Survival Analysis, John Wiley & Sons

Deshpande, J.V. and Purohit S.G. (2005). Life Time Data: Statistical Models and Methods, Word Scientific.

Cox, D.R. and Oakes, D. (1984). Analysis of Survival Data, Chapman and Hall

Barlow R.E. and Proschan F. (1975): Statistical Theory of Reliability & Life Testing, Holt, Reinhart and Winston.

References

Muralidharan, K. and Syamsundar, A. (2012): Statistical Methods for Quality, Reliability and Maintainability, PHI Learning Pvt. Limited.

Miller, R.G. (1981) : Survival analysis, John Wiley.

Sub Code: BSMS18F5073	Data Mining	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

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

Course objectives

To understand the scope and importance of data mining in solving real-world problems.

To provide an understanding of the fundamental concepts of data mining and data warehousing.

To examine the types of data to be mined and apply pre-processing methods on raw data.

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/	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
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	Cos										
BSMS18F5073	CO1	3	3	3	2			1	2	3	
	CO2	3	2	2	3			1	3	3	2
	CO3	2	3	3	3			1	3	2	3
	CO4	2	3	2	3			1	3	2	3

Unit1 06 Hrs
 Data Mining: Motivations and importance, Knowledge Discovery in Databases (KDD) process - search, induction, querying, approximation and compression. Kinds of data considered for data mining, basic data mining tasks, data mining issues, inter-connections between Statistics, Data Mining, Artificial Intelligence and Machine Learning. Applications of data mining.

Unit2 06 Hrs
 Data warehousing: Data marts, databases and data warehouses - OLTP systems, multidimensional models – data cubes, OLAP operations on data cubes, multidimensional schemes. Data pre-processing – data cleaning, data integration, data transformation and data reduction.

Unit3 06 Hrs
 Supervised learning – classification and prediction, statistical classification-Linear Discriminants-Mahalanobis’ linear discriminant, Regression based classification. k-NN (nearest neighbor) classifier. Tree classifiers-decision trees, ID3 algorithm CART.

Unit4 06 Hrs
 Unsupervised learning: Clustering problem, similarity and distance measures, Partitioning algorithms-k-means & k-medoids(PAM) algorithms.

Text Books

- G.K.Gupta (2014) Introduction to Data Mining with case studies, PHI Learning Pvt. Ltd
 - Jiawei Han, Micheline Kamber (2011): Data Mining-Concepts and Techniques, Morgan Kaufman Publishers, U.S.A
 - Rajan Chattamvelli: (2009): Data Mining Methods, Narosa Publishing House
 - Margaret.H.Dunham (2005): Data Mining-Introductory and Advanced Topics, Pearson Education.
- References**
- Daniel T. Larose, Chantal D. Larose (2014) Discovering Knowledge in Data: An Introduction to Data Mining, John Wiley & Sons.
 - Michael Berthold, David J. H and (Eds): (2003) Intelligent Data Analysis - An Introduction (2nd Ed), Springer.
 - 3. Trevor Hastie, Robert Tibshirani & Jerome Friedman (2001):The Elements of Statistical Learning:
 Data Mining, Inference and Prediction, Springer, New York,
 - 4. J.P. Marques de Sa: (2001):Pattern Recognition - Concepts, Methods and Applications, Springer

Sub Code: BSMS18F5081	Web Programming	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Front-end includes user interaction whereas Back-end involves server side coding i.e. Data

interaction. In Front end Developer most important languages are HTML, CSS and JavaScript.

Course Objectives:

Highlighting the theory and principle underlying website design
 Introducing the design principle and techniques of website design

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
BSMS18F50 81	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

Unit - I 6 Hrs
 Fundamentals of Web: Internet, WWW, Web Browsers, and Web Servers, URLs. XHTML: Origins and evolution of HTML and XHTML, Basic syntax, Standard XHTML document structure, Basic text markup, Images, Hypertext Links, Lists, Tables, Forms, Frames, Syntactic differences between HTML and XHTML.

Unit - II 6 Hrs
 Java Script: Overview of JavaScript; Primitives, Operations, and expressions; Screen output and keyboard input; Control statements; Object creation and Modification; Arrays; Functions; Constructor; Examples

Unit - III 6 Hrs
 Java Script and HTML Documents, Dynamic Documents with JavaScript, The JavaScript execution environment Element access in JavaScript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; Element visibility; Changing colors and fonts; Dynamic content;

Unit - IV 6 Hrs
 CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The Box model, Background images, The and <div> tags. Conflict resolution.

Text Books :
 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,

Sub Code: BSMS18F5082	Visual Programming	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

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

Course Objectives:

- To introduce the concepts of visual programming.
- To introduce GUI programming using Microsoft foundation classes.
- 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
BSMS18F508 2	CO1	2	2	1	2	3	3	3	1	3	3
	CO2	1	3	3	3	3		3		3	3
	CO3	3	3	3		3		3	2	3	3
	CO4	3	3	3	1	3	3			3	3

Unit – I

6 Hrs

Introduction to Visual Programming: Features of Visual Basic, Advantages and Disadvantages of Visual Basic, Types of Visual Basic Applications, The Integrated Development Environment

(IDE).A standard EXE Project: Title bar, Menu bar, Tool bar. Windows: Project Window, Form Designer Window, ToolBox, Properties Window, Form Layout Window. Form Object And Controls: Form Object, Control Menu, MinButton and MaxButton, Title Bar, Moveable, StartUpPosition, WindowState. Form Properties: Name, Caption, Back color, Border style, Height, Width, Scalemode, Forecolor, Font, Visible etc. Form Events –Load, Unload, Click. Form Methods – Show, Hide, Cls, Print Form. Intrinsic Controls: Adding and Removing Control.

Unit – II 6 Hrs
 Properties and Events of Different Controls- Label, Command Buttons, TextBox, Frame, Option Button, Check Box, Combo Box, List Box, Picture Box, Image Box, Timer Control, ScrollBars, MM Controls. Predefined Dialog Boxes: MsgBox and InputBox. Programming in VB: Event-Driven Programming, Types of Events, Writing Event Procedures, Common Events-Mouse Events, Keyboard Events and Focus Events.

Unit – III 6 Hrs
 Looping Structures: Entry-Controlled and Exit- Controlled, Do-Loop, While-Wend, For-Next. Functions, Built-In Functions-Numeric Functions, Formatting Functions, String Functions and Date Functions. Creating and calling Functions. Arguments: Passing Arguments By Value, Passing Arguments By Reference. Modules. Designing Menus: The Menu Editor, Menu Editor Properties, Designing Multiple Document Interface forms (MDI Forms).

Unit – IV 6 Hrs
 Microsoft Common Controls: Date Time Picker, Common Dialog, Database Connectivity – Introduction, ADO Data Control (ADODC), Data Grid Control, Properties Methods and Events of ADO Data Control. Common Properties of Data Aware Controls: Data Source, Data Field, Data Format and Data Member. Methods: AddNew, Update, Delete, Edit, Refresh and Find Methods. Navigation Methods: MoveFirst, MoveLast, MovePrevious, MoveNext.

Text Books:

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

Reference Books:

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

Sub Code: BSMS18F5083	Computer Graphics	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Knowledge of analytic geometry, linear algebra (vector, matrix), knowledge of C++ is not necessary but is helpful.

Course Objectives:

This course is designed to provide a comprehensive introduction to computer graphics.
 Introduction to computer graphics techniques, focusing on 2D modelling.
 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
BSMS18F5083	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

Unit – I 6 Hrs
 Graphics Systems: Application of CG, CRT Functioning- Factors Affecting CRT- Raster scan System–Shadow mask method, Output Primitives Line drawing methods-DDA and Bresenham's, line attributes,-Circle drawing-Direct and mid point circle drawing.

Unit – II 6 Hrs
 Two Dimensional Transformation: Basic Transformation, Translation, Rotation, Scaling-Reflection and Shear matrix representations- Homogeneous co-ordinates- composite transformation

Unit – III 6 Hrs
 Windowing and Clipping: Viewing Transformations, Clipping process, Point clipping, Line Clipping, Cohen Sutherland line clipping algorithm, Midpoint Subdivision algorithm, Text clipping.

Unit – IV 6 Hrs
 Three Dimensional Graphics: 3D-coordinate system,3D-Display techniques,3D-transformations, Octrees, Bezier curves. Graphical Input Techniques: Positioning techniques Gravity field, Rubber band, Selection technique, Menu, Pointing and selection by naming.

Text Books:

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

Reference Books:

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

Sub Code: BSMS18F5100	Design and Analysis of Experiments	L	T	P	C	CH
Duration: 14 Weeks	Lab	0	0	2	2	3

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
BSMS18F510	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)

ANOVA for one way classified data.

ANOVA for two way classified data.

Analysis of CRD.

Analysis of RBD.

Analysis of LSD.

Missing plot techniques in RBD and LSD

Analysis of 2^2 factorial experiment using RBD layout.

Analysis of 2^3 factorial experiment using RBD layout.

Analysis of 2^3 factorial experiment using RBD layout. (Complete confounding)

Analysis of 2^3 factorial experiment using RBD layout. (Partial confounding)

Text Books

Montgomery, D.C. (2014). *Design and Analysis of Experiments*, Wiley. New York.

Goon A.M., Gupta, M.K., Das Gupta, B. (1991). *Fundamentals of Statistics*, Vol.I, WP, Calcutta.

Joshi, D. D. (1987). *Linear Estimation and Design of Experiments*, New Age International (P) Limited, New Delhi.

References

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

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

Sub Code: BSMS18F5200	Java Programming Lab	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

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
BSMS18F5200	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

PART – A

Write a program to find factorial of list of number reading input as command line argument.

Write a program to display all prime numbers between two limits.

Write a program to implement all string operations.

Implementation of super and this.

Implementation of static variables and methods.

Write a program to find area of geometrical figures using abstract method.

Write a program to implement constructor overloading by passing different number of parameter of different types.

Write a program to calculate bonus for different departments using method overriding.

To implement multithreading by extending Thread class

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).

Sub Code: BSMS18F5300	Web Programming Lab	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

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
BSMS18F5300	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

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).

Sub Code: BSMS18F5300	Visual Programming Lab	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

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

Course Code	POS/ Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F5300	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

PART – A

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.

Write a VB Program to design a simple calculator to perform addition, subtraction, multiplication and division (Use functions for the calculations).

Design a small Alarm Clock Application.

VB program to Encrypt and Decrypt a string. (Use Rnd() to generate the Encryption and decryption keys).

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.

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.

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.

Write a VB Program to Validate the username and password form the database and display the appropriate message.(Use Data Control)

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.

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).

Sub Code: BSMS18F5300	Computer Graphics Lab	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

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
BSMS18F5300	CO1	1	1	2	3	2	1	2	1	2	1
	CO2	2	2	2	3	2	2	2	2	2	2
	CO3	1	2	1	3	3	3	1	1	1	2
	CO4	2	3	2	2	1	2	3	3	2	3

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).

VI – Semester

Sub Code: BSMS18F6010	Numerical Methods	L	T	P	C	CH
Duration: 14 Weeks		1	1	0	2	3

Prerequisites:

Differential equations and linear algebra

Course objectives:

The main objective of this course is to provide students with an introduction to the field of numerical analysis. Aside from developing competency in the topics and emphases listed, the course aims to: further develop and apply problem solving skills through the introduction of numerical methods; 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	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F60 10	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

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 9 Hrs Finite differences: Forward difference, Backward difference and Shift Operators – Separation of symbols – Newton’s Formulae for interpolation – Lagranges interpolation formulae - Numerical differentiation – Numerical integration: Trapezoidal rule, Simpson’s one-third rule and Simpson’s three-eighth rule.

Unit-III: Numerical Solution of First order Differential Equations 9 Hrs
 Numerical solution of ordinary differential equations – Taylor’s series – Picard’s method – Euler’s method – Modified Euler’s method – RungeKutta methods - second order (with proof) and fourth order (without proof).

Unit-IV: Numerical Solution of Second order Differential Equations and simultaneous DE 9 Hrs
 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:

S S Sastry, Introductory methods of Numerical Analysis, 3rd ed. New Delhi, India: Prentice Hall of India, 1999.
 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, 8th 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, 4th ed. New Delhi, India: New Age International, 2003.

Sub Code: BSMS18F6020	Operations Research	L	T	P	C	CH
Duration: 14 Weeks		1	1	0	2	3

Prerequisites:

Knowledge of linear algebra, basics of probability and probability distributions

Course Objectives

To apply the knowledge of operational research in the field of agriculture, industry, transportation and economics

To discover the feasible solution for transportation and assignment problems

To optimize the existing policies in inventory and replacement theory

To explore the various theories of operations research

Course Outcomes:

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

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

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F6020	CO1	3	3	3	2	0	0	1	2	3	0
	CO2	3	2	2	3	0	0	1	2	2	2
	CO3	2	3	3	3	0	0	1	3	1	3
	CO4	3	3	2	3	0	0	1	3	2	3

Unit 1 09 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 09 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 09 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

09 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 Book

J K Sharma *Operations Research Theory & Methods, 5 edition*

Kanthi Swaroop, Manmohan and P.K. Gupta (2012). *Operations Research*, Sultan Chand, New Delhi.

Kalavathy, S.(2004). *Operations Research*, Vikas Publishing House Pvt. Ltd. New Delhi.

Chandrasekhara Rao & Shanthi Lata Mishra, *Operations research*, Alpha Science International, 2005.

Shenoy, G.V., Srivastava, U. K., and Sharma, S.C. (2009). *Operations Research for Management, 2/e*, New Age International, New Delhi.

Churchman, C.W, Ackoff, R.L., and Arnoff, E.L. (1957). *Introduction to Operations Research*, John Wiley and Sons, New York.

References

Taha, H.A. (2010). *Operational Research: An Introduction*, Macmillan, New York

Mustafi, C.K. (2006). *Operations Research: Methods and Practice*, 3/e, New Age International, New Delhi.

F.S. Hillier and G.J. Lieberman, *Introduction to operations research*, 9th Edition, McGraw-Hill, 2009.

Mital, K.V. and Mohan, C. (2004). *Optimization Methods*, 3/e, New Age International, New Delhi.

Narag, A. S. (1970). *Linear Programming and Decision Making*, S. Chand, New Delhi.

Sub Code: BSMS18F6030	Software Engineering	L	T	P	C	CH
Duration: 14 Weeks		1	1	0	2	3

Prerequisites:

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

Course Objectives:

To provide students an in depth understanding of software engineering principles.

To prepare the students to develop the skills necessary to handle software projects.

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

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F6030	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

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.

TextBooks:

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

Reference Books:

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

Sub Code: BSMS18F6041	Fuzzy Mathematics	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Basic knowledge of set theory

Course Objectives:

Students will study the fuzzy sets, basic operation on fuzzy sets and inverse fuzzy operations.
 Students will study fuzzy subsets and its properties.
 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
BSMS18F6041	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

Unit – I 6 Hrs
 Introduction- Fuzzy subsets-Lattices and Boolean Algebras- L fuzzy sets-operations on fuzzy – level sets – properties of fuzzy subsets.

Unit – II 6 Hrs
 Algebraic product and sum of two fuzzy subsets-properties satisfied by Addition and product-cartesian product of fuzzy subsets.

Unit – III 6 Hrs

Introduction- Algebra of fuzzy relations-logic-connectives.

Unit – IV

6 Hrs

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

Text Books:

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

Reference Books:

M.Ganesh, Introduction to Fuzzy Sets & Fuzzy Logic, Prentice Hall of India Pvt. Ltd., 2006.

John N.Mordeson and Premchand S.Nair, Fuzzy Mathe

Sub Code: BSMS18F6042	Topology	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Set theory and properties of set theory.

Course Objectives:

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

Course Outcomes:

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
BSMS18F6042	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

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:

C.O. Christenson and W.L. Voxman. Aspects of Topology.

J.R. Munkres. General Topology.

I.M. Singer and J.A. Thorpe. Lecture Notes in Elementary Topology and Geometry.

K. Chandrasekharan. A Course on Topological Groups.

W. Fulton and J. Harris. Representation Theory.

F.W. Warner. Foundations of Differentiable Manifolds and Lie Groups.

Sub Code: BSMS18F6043	Discrete Mathematics and Graph Theory	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Sets, relations, trees, graphs and Boolean algebra.

Course Objectives:

The main objective of this course is to provide an understanding of the concepts

To study the set theory, logic, Recurrence relations and functions and to know the application of Boolean Algebra to switching theory

To understand and apply the fundamental concepts in graph theory

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
BSMS18F6043	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
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Unit-I: Discrete numeric functions and Generating functions: 6 Hrs
 Introduction, Manipulation of numeric functions, Asymptotic behaviour of numeric functions, Generating functions. Recurrence relations and Recursive Algorithms: Introduction, Recurrence relations, Linear recurrence relation with constant coefficients, Homogeneous solutions, particular solutions.

Unit-II: Boolean algebra: 6 Hrs
 Application of Boolean Algebra to switching theory. Languages - Recognition and generation - Phase structure grammars and languages – Finite state Machine - Recognition in regular languages.

Unit-III: Graph Theory -1 6 Hrs
 Graph, finite, Infinite graphs, Incidence and degree, Isolated vertex, Pendent vertex, Null graph, Isomorphism, Sub-graphs, Walks, Paths, Circuits, Connected and disconnected graphs, Components, Euler graphs, Operation on graphs, Hamiltonian paths, Circuits, Trees and some properties of trees, Rooted and binary tree, Spanning tree and fundamental circuits.

Unit-IV: Graph Theory -2 6 Hrs
 Cutsets, Properties, Fundamental cut sets, Connectivity, Separability, Planar graphs, Kuratowski's graphs, Different representation of planar graphs, Geometric dual, Ring sum of two circuits, Subspace, Orthogonal vectors, Matrix representation, Incidence matrix, Cutset matrix, Circuit matrix, Adjacency matrix.

Text Books:

Elements of Discrete Mathematics 3rd edition by C.L. Liu, Tata Macgraw Hill Publishers (2008).
 Discrete Mathematical Structures with Applications to Computer Science by J.P. Trembley and R. Manohar, TataMagrawHill Publishers
 Kenneth H. Rosen, Discrete Mathematics and its Application, Fifth edition, Tata McGraw-Hill Publishing company PVT .Ltd., New Delhi, 2003 4

Reference Books:

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

Sub Code: BSMS18F6051	Applied Statistics	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Knowledge of basic mathematics and basic statistics

Course Objectives

- To document the demographic data
- To construct index numbers and time series for various periods
- To compose the per capita income at various sectors of national economy

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
BSMS18F6051	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

Unit-I

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-II

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-III

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-IV

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

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

References

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

Sub Code: BSMS18F6052	Econometrics	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Knowledge of linear algebra, calculus, descriptive statistics, probability distributions and statistical inference.

Course Objectives:

To ensure the students have a solid understanding of the probability and statistical foundations of econometrics.

To introduce the linear regression model, and explore its numerical and statistical properties.

To discuss the range of problems those arise in the analysis of economic data, and the methods available to address those problems.

To give the students experience in the analysis of real life data pertaining to economics and business.

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
BSMS18F6052	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-I

6 hrs

Introduction: Econometrics-nature, models-linear and non-linear, aims, types of data. Econometrics and statistics. Econometrics and regression analysis.

Unit-II

6 hrs

Simple linear regression analysis: Definition. Model, Ordinary Least Square (OLS) estimators-properties, Inference in the least square model.

Course Contents:

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-IV

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

Jeffrey M. Wooldridge (2015) Introductory Econometrics: A Modern Approach.6th Ed., Cengagelearning, Boston, U.S.A.

Damodar Gujrati (2014) Econometrics by Example, 2nd Ed, Macmillan International Higher Education

G.S. Maddala (2002): Introduction to Econometrics, Third edition, John Wiley.

References

Badi H. Battagi (2012): Econometrics, Springer Science and Business media.

Draper N.R. and Smith H. (1998): Applied Regression Analysis, 3rd Ed., John Wiley and Sons, Inc.

Sub Code: BSMS18F6053	Actuarial Statistics	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Knowledge of financial mathematics, linear algebra, calculus, descriptive statistics, probability distributions and statistical inference

Course Objectives:

To provide students with the theoretical background needed to qualify them to pursue graduate level education in Actuarial Science or related fields.

To equip students to apply mathematical and statistical knowledge in the field of insurance and finance.

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
BSMS18F6053	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

Unit-I 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-II 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-III 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-IV 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

Dale S. Borowiak, Arnold F. Shapiro (2013). Financial and Actuarial Statistics: An introduction, Chapman and Hall/CRC, London, United Kingdom.

Deshmukh, S. R. (2009). Actuarial Statistics: An introduction using R, Universities Press, Hyderabad, India.

References

J. F. Steffensen (2016) Some Recent Researches in the Theory of Statistics and Actuarial Science, Cambridge University Press, London, United Kingdom

Dickson, C. M. D. (2005): Insurance Risk And Ruin (International Series On Actuarial Science), Cambridge University Press.

Benjamin, B. and Pollard, J.H. (1980) Analysis of Mortality and Other Actuarial Statistics, 2nd edition, Heinemann, London.

Sub Code: BSMS18F6061	Computer Networks	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Data communications, digital transmissions, protocols and layers.

Course Objectives:

- To study about network components.
- To study about topologies and network models.
- 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
BSMS18F6061	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

Unit-I

6 Hrs

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

Unit-II

6 Hrs

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

Unit-III

6 Hrs

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

Unit-IV

6 Hrs

Network Layer: Addressing IPV4 addresses - IPV6 Addresses Internet Protocol: IPv4 –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.

TextBooks:

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.

Sub Code: BSMS18F6062	Design and Analysis of Algorithms	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Basic mathematics and C programming basics

Course Objectives:

Analyze the asymptotic performance of algorithms.
Write rigorous correctness proofs for algorithms.

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
BSMS18F6062	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

Unit – I

6 Hrs

Introduction: Performance Analysis - Space complexity and Time complexity (posteriori testing, and a priori approach), Asymptotic Notations (O , Ω , Θ). 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.
[06 Hours]

TextBooks:

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.

Sub Code: BSMS18F6063	Computer Architecture	L	T	P	C	CH
Duration: 14 Weeks		2	0	0	2	2

Prerequisites:

Combinational circuits and assembler programming, memory hierarchy and memory caches

Course Objectives:

Provide students with the basic concepts and principles in computer architecture.

To read and understand technical articles or promotional brochures that describe new computer architectures.

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
BSMS18F6063	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

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, 2nd Edition Prentice Hall of India.

Reference Books:

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

Sub Code: BSMS18F6090	Mathematics Lab - V	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

Prerequisites:

Definition of linear transformations, evaluation of double and triple integrals

Course Objectives:

Students who take this course will be able to:

Interpret derivatives of vector valued functions as velocity and acceleration functions.

Learn to evaluate multiple integrals.

Explain the definition and properties of vector space and its base.

State the linear transformation and find range, image, rank and nullity of the given transformation.

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
BSMS18F6090	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

Verification of Green's theorem.

Verification of Gauss Divergent theorem.

Verification of stokes theorem

i. Expressing a vector as a linear combination of given set of vectors

ii. Examples on linear dependence and independence of vectors

i. Evaluation of basis and dimension

ii. Verifying whether a given transformation is linear or not

Finding a matrix of linear transformation

Finding a linear transformation of a matrix.

Verification of Rank nullity theorem.

To demonstrate the physical interpretation of gradient ,divergence and curl

To write gradient, divergence, curl and laplacian in cylindrical coordinates

To write gradient divergence, curl and laplacian in spherical co ordinates.

i. Evaluation of the line integral with constant limits

ii. Evaluation of the line integral with variable limits

i. Evaluation of the double integral with constant limits

ii. Evaluation of the double integral with variable limits

i. Evaluation of the triple integral with constant limits

ii . Evaluation of the triple integral with variable limits

Evaluation of surface area of revolution

Evaluation of volume of revolution

Sub Code: BSMS18F6100	Numerical Methods Lab	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

Prerequisites:

Basic concepts of numerical methods

Course objectives:

The main objective of this course is to provide students with an introduction to the field of numerical analysis. Aside from developing competency in the topics and emphases listed, the course aims to: further develop and apply problem solving skills through the introduction of numerical methods; 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

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BSMS18F6100	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

Solving algebraic equation using Bisection method

Solving algebraic equation using Regula – Falsi method

Solving algebraic equation using Newton – Raphson method

Solving system of equation using Jacobi method

Solving system of equation using Gauss – Seidel method

Solving for largest Eigen value by power method

Solving ordinary differential equation by modified Euler's method.

Solving ordinary differential equation by Runge - kutta methods of 4th order.

Evaluating integrals using Trapezoidal Rule.

Evaluating integrals using Simpson's $\frac{1}{3}$ rd rule.

Evaluating integrals using Simpson's $\frac{3}{8}$ th rule.

Finding values of functions using interpolation.

Sub Code: BSMS18F6200	Operations Research Lab	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

Prerequisites:

Knowledge of linear algebra, basics of probability and probability distributions

Course Objectives

To apply the knowledge of operational research in the field of agriculture, industry, transportation and economics

To discover the feasible solution for transportation and assignment problems

To optimize the existing policies in inventory and replacement theory

To explore the various theories of operations research

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
BSMS18F6200	CO1	3	3	3	2	1	0	1	1	2	3
	CO2	3	2	2	3	1	0	1	3	1	2
	CO3	2	3	3	3	1	0	1	3	3	3
	CO4	3	3	2	3	1	0	1	3	3	3

List of Assignments

Formulation of linear programming problem (LPP) - graphical solution.

Solution of LPP - simplex algorithm - 1

Solution of LPP - simplex algorithm - 2

Transportation problems - 1 (IBFS)

Transportation problems - 2 (OBFS)

Assignment problems

Game theory problems.

Inventory problems

Replacement problems

PERT & CPM

Sub Code: BSMS18F6300	Computer Science Project Work	L	T	P	C	CH
Duration: 14 Weeks		0	0	2	2	3

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
BSMS18F6300	CO1	3	1	1	3	2	1	1	2	3	3
	CO2	3	1	1	2	2	1	1	1	3	3
	CO3	2	1	1	2	2	3	3	2	3	3
	CO4	2	1	1	3	2	2	3	2	3	3

CAREER 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.

Rukmini Knowledge Park
Kattigenahalli, Yelahanka,
Bengaluru – 560064, INDIA

Tel : +91 80 4696 6966
Fax : +91 80 4696 6998

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