YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. MATHEMATICS, STATISTICS & COMPUTER SCIENCE
FIRST SEMESTER
ACADEMIC YEAR 2022-23 OF 2022-25 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ Week	Duration of semester exams	Marks			Credits
						Internal	External	Total	
THEORY									
1	I	EN18101	General English-I (AECC-I)	3	3	40	60	100	3
2	I	VE18101	Value Education & Personality Development (AECC-II)	2	3	40	60	100	2
3	II	MS22102	Fundamentals of Information technology (GE-1)	4	3	40	60	100	3
4	II	MS22101	Differential Calculus & Number Theory (Core Course-1)	5	3	40	60	100	5
5	II	BS19025	Descriptive Statistics & Probability (Core Course-2)	4	3	40	60	100	4
6	II	BS19123	Problem solving and programming in C (Core Course-3)	5	3	40	60	100	4
PRACTICALS									
7	II	BS19026	Descriptive Statistics & Probability lab (Core Course-2)	2	3	40	60	100	1
8	II	BS19124	C Programming lab (Core Course-3)	2	3	40	60	100	1
9	II	BS22102	Fundamentals of Information technology Lab (GE-1)	2	3	40	60	100	1
Total				**29**		400	600	1000	**24**

Ability Enhancement Compulsory Course (AECC) Generic Elective (GE)

GENERAL ENGLISH – I

(AECC – I)

Credits: 3 **Semester: I**

Subject Code: EN18101 **No of Lecture Hours: 45**

Objectives:

- To enhance the learners' communication skills by giving adequate exposure in reading, writing, listening and speaking skills and the related sub-skills.
- To develop oral and written communicative skills among the students so that their employability enhances and English becomes the medium of their livelihood and personality.

Outcome: Through an exposure to contemporary passages, the students would be able to have a grasp on the language of today, with specific emphasis on the Listening, Speaking, Reading and Writing skills. Through the components of a passage, vocabulary and grammar section, speaking component and writing segments, there is a holistic development for language proficiency and fluency.

CO1: To distinguish between words which are either spelt or pronounced alike, yet render distinct meanings; imparting a sound clarity on everyday usage of language, and for developing the art of parallel listening and writing. (II understand)

CO2: To construct vocabulary and to gain understanding on the tense component, a pivotal constituent for language structuring and vocabulary building. (VI create)

CO3: To identify with economical word constructions, paying specific attention in constructing sound writing skills. (IV analyze)

CO4: To interpret functional grammar, the basic part involved in sentence constructing to improve linguistic skills. (II understand)

CO5: To develop communication skills to provide a platform for language efficiency for effective language delivery. (VI create)

UNIT I **9Hrs**

Wit and Humor

From the text "A Tea Party" by Ruth Prawer Jhabvala

- Explanation of the text 2
- Grammar----Nouns, Articles 2
- Vocabulary---Homonyms, homophones, homographs 2
- Writing Skill--- Note- Making 2
- Speaking Skill – Note-Making 1

UNIT II **9Hrs**

Risk Management

From the text "Deadly Factory Fires in India."

Explanation of the text 2

- Grammar----Tenses – The Present Tense 2
- Vocabulary ---Synonyms 2
- Writing Skill--- Information Transfer 2
- Speaking Skill--- 1

UNIT III **9Hrs**

Human Values

From the text" India's Contribution to World Unity"

- Explanation of the text 2
- Grammar--- Tenses- The Past Tense 2
- Vocabulary ---- Adjective and Adverb Suffixes 2
- Writing Skill--- Formal Letters. Curriculum Vitae 2
- Speaking Skill--- JAM 1

UNIT IV **9Hrs**

The Cyber Age

From the text "Polymer Bank Notes"

- Explanation of the text 2
- Grammar----Concord or Subject Verb Agreement 2
- Vocabulary -----Word Formation. Collocations. 2
- Writing Skill---- References and Bibliographies. 2
- Speaking Skill--- Presentations 1

UNIT V **9Hrs**

Sports

From the text "Sachin Tendulkar"

- Explanation of the text 2
- Grammar------Adjectives, Comparison of Adjectives 2
- Vocabulary—Common Errors, Commonly Mispelt Words, Commonly Confused Words 2
- Writing Skill- Technical Reports, Project Reports 2
- Speaking Skill----Group Discussions 1

ESSENTIAL READING

1. Skills Annexe – Functional English for Success. Orient Black Swan.

SUGGESTED READING

1. Balasubramaniam, M. 1985. **Business Communication**. New Delhi: Vani Educational Books.
2. Krishna Mohan and Meera Banerjee, 1990. **Developing Communication Skills**. New Delhi: Macmillan India Ltd.
3. Krishnaswamy.N. and Sriraman, T. 1995. **Current English for Colleges**. Chennai: Macmillan India Ltd.
4. Narayanaswamy, V.R. 1979. **Strengthen Your Writing**. New Delhi: Orient Longman.
5. Sharma, R.C. and Krishna Mohan. 1978 **Business Correspondence.** New Delhi: Tata McGraw-Hill Publishing Co.

VALUE EDUCATION & PERSONALITY DEVELOPMENT
(AECC – II)

Credits : 2 **Semester: I**

Subject code : VE18101 **No. of Lecture Hours: 30**

Objective:

- To produce intellectually competent, morally upright, socially committed, spiritually inspired citizens in the service of the nation and the world.
- To transform the students into conscientious citizens through holistic education and contribute to nation building.

Outcome:

CO1: Students will be able to differentiate Accepted norms and Counter values and be able to **identify** the various Dimensions of Human Development.

CO2: Students will be able to **demonstrate** Love and Experience of God and identify the Basic Issues of Life and Happiness as a life goal.

CO3: They will able to **understand** the importance of Concern for others and critique the various problems that deter the growth of the society.

CO4: The students will be able to **recognize** the traits of a good personality and practice Self-exploration.

CO5: Students will be able to **interpret** the Purpose of Life and Goal Setting and demonstrate Self-management.

UNIT- I **6Hrs**

Introduction to Ethics

- Why Value Education?
- Reasons to have Ethics for Life
- Accepted Norms and Counter Values
- Dimensions of Human Development: Physical, Intellectual, Emotional, Moral, Spiritual and Social

UNIT-II **6Hrs**

Approach to Life

- Conscience and Pseudo-Conscience
- Happiness as Life-goal
- Values revealed and lived in Religions
- Experience of God
- Love: The three components of Love
- Some of the basic stages and issues of Life: Family, Love, Sex, Marriage

UNIT-III **6Hrs**

Concern for Others

- Self and Another
- Human Context
- Moral Problems of a Society / True Society: Social Desire, Social Fear, Social Silence, Social Indifference

UNIT-IV **6Hrs**

Transformation of Self

- Definitions of personality
- Characteristics of personality
- Elements of personality
- Traits of good personality
- Self-Identity, self concept
- Self-Discovery, self-acceptance
- Self-Esteem

WORK SHEET (1): Self Estimation

UNIT-V **6Hrs**

Life Enrichment Skills

- Purpose of life - Goal setting
- Characteristics of Goals
- Building Relationships
- Time Management
- Stress Management
- Emotional Management
- Conflict Management
- Team Management (Group Dynamics)

WORK SHEETS (1) & (2): 1) Anger Management
2) Team Management

ESSENTIAL READING

1. *Human Values - Development Programme - AIACHE*
2. *In Harmony*

FUNDAMENTALS OF INFORMATION TECHNOLOGY
(GE – I)

Credits: 3 **Semester: I**

Subject Code: MS22102 **Number of Hours: 60**

Objective: To understand the application of computer and telecommunications equipment to store, retrieve, transmit and manipulate data in the context of business or an enterprise.

Outcomes: The students would be able to
CO1: Understand basic computer terminology and number systems.
CO2: Learn about operating systems, and its types.
CO3: Learn about the applications of Information Technology.
CO4: Importance of system development and the phases of SDLC.
CO5: Use of modern means of communication, types of networks and topologies.

UNIT I **12 Hrs**

Introduction to Computers

Introduction – characteristics and limitations of computers	1
Block diagram of a computer, CPU	1
Primary and secondary storage	1
Input and output devices	1

Data representation and storage

Data representation in computers, bits and bytes	1
Number systems (Binary, Octal and Hexadecimal)	1
Conversion from decimal to binary, octal, hexadecimal and vice versa	2
Secondary storage	1
Random Vs sequential access, tracks and Sectors	1
Storage Characteristics	1
Increasing data storage capacity through compression (disk compression and file compression)	1

UNIT II **12 Hrs**

Meaning, definition, functions	2
Types of operating systems: Desktop OS, Server OS, Mainframe OS, Hand – Held OS and Embedded OS	1
Multitasking and Multithreading	1

Multiuser muti processor support	1
Miscellaneous tasks	1
Batch processing systems	1
Real time systems, time sharing systems	1
User Interfaces	
GUI, pen based, touch screen & conversational interfaces	2
Common operating systems: DOS, Windows 95/98 and UNIX	2

UNIT III	**12 Hrs**
Applications of Information Technology	
Application programs	2
Horizontal market applications, vertical market applications	1
Customs applications, Shareware and Public domain software	1
Transaction Processing	
Centralized transactions processing	1
Client server software, distributed computing and replication	1
Information tools for management control: DSS, EIS, GIS, OLAP	2
Data Warehousing and Data Mining	1
IT in Business and Industry	
Home and at play, Education and training, Entertainment and Arts	1
Science, Engineering and Math, computers in hiding	1
IT Enabled Services	
BPO, KPO and call centers	1

UNIT IV	**12 Hrs**
Systems Development	
The six phases of system analysis & design	2
The Challenges of Digital Age	
Security issues: Threats, to computers & communications	2
Security: Safeguarding computer & communications	2
Quality of life issues	2
The ethics of using databases: concerns about accuracy & privacy	2
Five generations of programming languages	2

UNIT V	**12 Hrs**
Modern Communications	
Communications, FAX	2
Voice mail and information Services, Email	2
Group Communications	
New groups, Mailing lists, IRC, Network games	2
Video conferencing	1
File exchange, bandwidth	1
Modem, network topologies	2
Network types – LAN, MAN and WAN	1
Dailup Access	1

ESSENTIAL READINGS:

1. Curtin Dennis, P. and Foley, Kim 2000. Information Technology – The Breaking Wave. 7th Edition. Tata McGraw Hill Publications: New Delhi.
2. William Brian, K. and Swayer Stacey C.20007. Using Information Technology – A Practical Introduction to Computers and communications 6th Edition. Tata McGraw Hill Publications, New Delhi.

SUGGESTED READINGS:

1. Sinha Pradeep, K and Sinha Preethi 2007, Computer Fundamentals, concepts, systems and applications, 4th edition BPB Publications.
2. Rajaraman 2006, Fundamentals of Computers, 4th edition, PHI Publications.
3. Bharihoke Deepak 2000, Fundamentals of Information Technology, 2nd edition, Excel books.

DIFFERENTIAL CALCULUS AND NUMBER THEORY

(Core Course – 1)

Credits : 5 **Semester: I**

Subject Code : MS22101 **No. of Lecture hours: 75**

Objectives: To expose the students to some basic Notions in differential Calculus and Number Theory.

Outcome:

CO1: understand the applications of partial differentiation. To estimate maxima and minima of multivariable function.

CO2:. Demonstrate Radius of Curvature and Evolutes geometrically

CO3: Find Envelopes and Asymptotes

CO4: Express the concepts and results of Number Theory.

CO5: **Demonstrate** knowledge and understanding of topics including divisibility, prime numbers, congruences, Diophantine equations.

UNIT I Differential Calculus –I	**15 Hrs**
Partial Differentiation:	
Introduction - Functions of two variables - Neighborhood of a point (a, b)	2
Continuity of a Function of two variables, Continuity at a point	3
Partial Derivatives of Higher Order	3
Homogeneous Functions	2
Maxima and Minima of functions of two variables	
Lagrange's Method of undetermined multipliers.	5

UNIT II Differential Calculus –II	**15 Hrs**
Introduction - Definition of Curvature - Radius of Curvature	4
Length of Arc as a Function, Derivative of arc	4
Radius of Curvature - Cartesian Equations	
Newtonian Method - Centre of Curvature - Chord of Curvature.	3
Evolutes: Evolutes and Involutes - Properties of the evolute.	4

Unit III Differential Calculus –III	**15 Hrs**
Envelopes: One Parameter Family of Curves	5
Determination of Envelope. Envelopes- Family of Curves and its envelope	5
Asymptotes- Vertical Asymptotes- Horizontal Asymptotes- Oblique Asymptotes	5

UNIT-IV	**15Hrs**
Early Number Theory	
Divisibility-The Division algorithm	5
Euclid' algorithm- The Diophantine equation ax + by = c	5
Greatest Common Divisor - Properties of G.C.D.	3
Primes – Fundamental theorem of Arithmetic.	2

UNIT-V	**15 Hrs**
Congruences – Properties- Applications of Congruences	3
Linear Congruences - Solutions of Congruences	4
Fermat's theorem and its Applications	4
Wilson's theorem and its Applications	4

ESSENTIAL READING

1. Shanti Narayan, P.K. Mittal Differential Calculus, S.CHAND, NEW DELHI
2. David M. Burton 2004 **Elementary Number Theory** Universal Book Stall New Delhi

DESCRIPTIVE STATISTICS & PROBABILITY
(Core course – 2)

Credits: 4 **Semester: I**

Subject Code : BS19025 **No. of Lecture hours: 60**

Objective: To prepare students for lifelong learning and successful careers using their statistical skills.

Outcome:

CO1: **Organize**, manage and present data and analyze statistical data using measures of central tendency

CO2: **Analyze** the statistical data using dispersion and location.

CO3: **Use** the basic probability rules, including additive and multiplicative laws, using the terms, independent and mutually exclusive events.

CO4: **Develop** the probability density function of transformation of random variables.

CO5: **Identify** probabilities and derive the marginal and conditional distributions of bivariate random variables.

UNIT I **12 Hrs**

Descriptive Statistics:

Concept of primary and secondary data 2

Methods of collection and editing of primary data 2

Designing a questionnaire and a schedule 2

Sources and editing of secondary data Classification and tabulation of data 2

Measures of central tendency (Mean, Median, Mode, Geometric mean and harmonic mean) with simple applications. 4

UNIT-II **12Hrs**

Absolute and relative measures of dispersion (Range, Quartile deviation, mean deviation and standard deviation) with simple applications. 4

Importance of moments– Central and non central moments and their interrelationships. 6

Sheppard's corrections for moments for ungrouped data - Skewness and Kurtosis - Their measures including those based on quartiles and moments with real life examples. 2

UNIT-III **12Hrs**

Probability:

Basic concepts in Probability – Deterministic and random experiments – Trail, outcome, sample space, event and operation of events- Mutually exclusive and exhaustive events –Equally likely and favorable outcomes with examples. 3

Mathematical, Statistical and axiomatic definitions of probability with merits and demerits 3

Properties of probability based on axiomatic Definition conditional probability and independence of events. 2

Addition and multiplication theorems for 'n' events. 2

Boole's inequality and Baye's theorem

Problems on probability using counting methods and theorems. 2

UNIT-IV	**12Hrs**
Random Variables:	
Definition of Random Variable, Discrete and continuous random variables	2
Functions of random variables, Probability mass function and probability density function with illustrations	2
Distribution function and its properties	2
Transformation of one dimensional random variable (simple 1-1 functions only)	
Notion of Bivariate random variable	2
Bivariate distribution and statement of its properties	2
Joint, Marginal and conditional distributions	1
Independence of random variables	1

UNIT-V	**12Hrs**
Mathematical Expectation: Mathematical expectation of random variable,	
Moments – Raw and central moments	2
Covariance using Mathematical expectation with examples	2
Addition and multiplication theorems of expectation	1
Definition of moment generating function (m.g.f)	1
Cumulant generating function (c.g.f)	1
Probability generating function (p.g.f)	1
and characteristic function (c.f)	
and statement of their properties with applications	2
Chebychev's and Cauchy-Schwartz's inequalities and their applications	2

ESSENTIAL READING

1. V.K. Kapoor and S.C. Gupta 2007. **Fundamentals of Mathematical Statistics.** New Delhi: Sultan Chand& Sons.

SUGGESTED READING

1. Goon AM, Gupta MK, Das Gupta B.2007 **Fundamentals of Statistics Vol-I**. Kolakota: The world press Pvt. Ltd.
2. M. Jagan Mohan Rao and Papa Rao, 2010 **A Text book of Statistics Paper-I.** Tenali: Deepti Publications
3. Willam Feller. 1990 **Introduction to Probability theory and its applications. Volume –I**, New Delhi: Wiley Publications.

PROBLEM SOLVING AND PROGRAMMING IN C
(Core Course – 3)

Credits : 4 **Semester: I**

Subject Code : BS19123 **No. of Lecture Hours: 75**

Objective: To understand major programming constructs this serves as the basis for any programming language.

Outcome: Students will be able to develop applications using functions, pointers, structures and file handling techniques.

Course Outcomes
CO1: Understand the basic introduction of computer and programming language
CO2: Identify 'C' data types, operators and data input /output functions
CO3: Categorize 'C' control structures, arrays and string concept
CO4: Explain 'C' function, recursion, pointers and dynamic memory allocation
CO5: Express the concept of structures, union and file handling in 'C'.

UNIT – I	**15Hrs**
Introduction to Computer, Block diagram of computer	2
Introduction to Computer software-System and application software	2
Algorithms and Flow charts	2
Introduction to C programming	2
Structure of C program	2
Files used in a C program	2
Compiling and executing C program	3

UNIT – II	**15Hrs**
1. C tokens, Constants, Character set in C, Keywords, Identifiers	2
2. Data Types in C, Enumerated data types, typedef	3
3. Variables and scope of a variables	3
4. Data input and output statements in C	2
5. Operators and expressions	3
6. Type conversion and Typecasting	2

UNIT – III	**15Hrs**
1. Conditional Branching Statement – if, if-else, if-else-if, switch case	3
2. Iterative Statements – while loop, do-while loop, for loop	3
3. Nested loops, break and continue statements, Go to statement	3
4. Arrays - Single and double dimensional arrays	3
5. String- string input output functions, string manipulation functions	3

UNIT-IV	**15Hrs**
1. Function- Declaring, defining and invoking functions	2
2. Categories of functions-Built-in functions	2
3. Passing parameters to functions – call by value & call by reference	2
4. Storage classes, Recursion	2

5. Pointers - Declaration, passing pointer to functions	2
6. Pointers and one dimensional arrays	3
7. Dynamic memory allocations.	2

UNIT – V **15Hrs**

1. Structures - Simple structures, nested structure, Array of structures	3
2. Unions-Differences between Structures and Unions.	3
3. File handling - Various modes, File operations – fopen(), fclose()	3
4. File input output functions – fputc(), fgetc(), fputs(), fgets(), getw(), putw(), getc(), putc(), fprintf(), fscanf(), getchar(), putchar()	3
5. Random accessing file – fseek(), ftell(),rewind()	3

ESSENTIAL READING

1. Thareja Reema. 2016. **Programming in C.** 2nd edition**.** New Delhi: OUP.
2. Kanetkar Yashwanth. 2018. **Let us C.** 16th Edition**.** New Delhi: BPB.
3. Gottfried Byron. 2010. **Programming with C (**Schaum's Outline Series**).** 3rd Edition. New Delhi: McGraw Hill Education

DESCRIPTIVE STATISTICS & PROBABILITY PRACTICALS
(Core Course – 2)

Credits : 1 **Semester: I**

Subject Code : BS19026 **No. of Practical Hours: 30**

Objective: To prepare students for lifelong learning and successful careers using their statistical skills.

Outcome: Students will be able to compute descriptive statistics and probabilities from data, using the application of correct statistical notation and language using Office automation.

LIST OF PRACTICALS

1. Graphical presentation of data (Histogram, Frequency polygon, Ogives).
2. Graphical presentation of data (Histogram Frequency polygon, Ogives) using Office automation.
3. Diagrammatic presentation of data (Bar and Pie).
4. Diagrammatic presentation of data (Bar and Pie) using Office automation.
5. Computation of measures of Central tendency (mean, median, mode, geometric mean and harmonic mean) using Office automation.
6. Computation of coefficients of Skewness and Kurtosis – Karl Pearson's and Bowley's β_1, β_2 for grouped data.
7. Computation of non-central and central moments-Sheppard's corrections for grouped data.
8. Computation of measures of dispersion (Mean deviation, Quartile deviation, standard deviation), coefficient of variation using Office automation.
9. Computation of Skewness, Kurtosis using Office automation

C PROGRAMING PRACTICALS
(Core Course - 3)

Credits : 1 **Semester: I**

Subject Code : BS19124 **No. of Practical Hours: 30**

Objective: To develop applications using structured programming.

Outcome: Students will be able to write, compile and debug programs in C language.

No. of Hours	Topic
1-2	Implementation of various arithmetic operators
3-4	Programs using If –condition statement
5-6	Programs using loop control structures
7-8	Programs using pointers and simple arrays
9-10	Programs using strings and functions
11-12	Programs using structures and union
13-14	Programs to implement various file opening modes

FUNDAMENTALS OF INFORMATION TECHNOLOGY PRACTICALS
(GE – I)

Credits : 1 **Semester: I**
Subject Code : BS22102 **No. of Practical Hours: 30**

Objectives:
- To expose and acquaint the student with the concepts of computer applications, software and the professional way of using the MS Office packages
- To train and practice with the MS Office package.

Outcome: Students will be able to create new documents using word, worksheets using excel, power point templates and simple data bases using office packages.

WORD:
Creating New Documents, Formatting text and documents, formatting paragraphs, Line spacing, margins and gutters, Columns page breaks. Repagination 1
1. Working with Headers, footers and foot notes, Tables 1
2. Word Drawing Features, Rotating and flipping objects, table of contents, Find and replace1

EXCEL:
3. Creating new worksheet, Editing Text, Formatting tips, Referencing cells 1
4. Functions – logical, Financial, Mathematical, Statistical, Date and time Formulae 1
5. Creating and Editing Charts, Linking Worksheet and Workbook, Macros 1
6. Automating what – If projects – scenario manager, data tables, Solver 1

POWER POINT:
7. Power Point templates, Views, Auto Content wizard, Design Templates, Masters, Editing and moving text 1
8. Formatting text, finding and replacing text, arranging, previewing and reharshing, transition and build effects, changing speed of the transition, automatically advancing slides, running a presentation continuously. 1
9. Changing slide timing, showing slides out of order, deleting slides, Printing presentation elements, deleting slides 1

ACCESS:
10. Creating simple database tables – Adding or deleting fields in tables, indexing fields Saving and modifying forms, Entering and editing data 1
11. Relational database – viewing relationships, Expressions in reports 1
12. Queries and forms, macros 1
13. Chart wizard – Charting the data, adding graphics to buttons 1
14. Linking, importing and exporting records 1

ESSENTIAL READING
1. **MS-OFFICE** –Ron Mansfield, New Delhi: Tata McGraw Hill Publishing Company Ltd.
2. **MS-OFFICE for Windows-95** Edward Jones and Deref Sulton.

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. MATHEMATICS, STATISTICS & COMPUTER SCIENCE
SECOND SEMESTER
ACADEMIC YEAR 2022-23 OF 2022-25 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ Week	Duration of semester exams	Marks			Credits
						Internal	External	Total	
THEORY									
1	I	EN18201	General English-II (AECC - III)	3	3	40	60	100	3
2	I	IC19201	Indian Heritage & Culture (AECC – IV)	2	3	40	60	100	2
3	II	MS19201	Computer Architecture (SEC – I)	5	3	40	60	100	4
4	II	MS22202	Differential Equations (Core Course-4)	5	3	40	60	100	5
5	II	BS22211	Probability Distributions (Core Course-5)	5	3	40	60	100	4
6	II	BS22202	C++ with data structures (Core Course-6)	5	3	40	60	100	4
PRACTICALS									
7	II	BS22212	Probability Distributions Lab (Core Course-5)	2	3	40	60	100	1
8	II	BS19204	C++ with data structures Lab (Core Course-6)	2	3	40	60	100	1
9	III	PL18001	PLANET *(Outreach)	-	-	-	-	-	1
Total				29		360	540	900	**25**

* Programme of Loyola Academy for Neighborhood Empowerment & Transformation (PLANET)

Ability Enhancement Compulsory Course (AECC) Skill Enhancement Course (SEC)

GENERAL ENGLISH -II
(AECC – III)

Credits : 3 **Semester: II**

Subject Code : EN18201 **No of Lecture Hours: 45**

Objective:
- To enhance the learner's communication skills by giving adequate exposure to increase their proficiency in reading, writing, listening and speaking skills and the related sub skills.

Outcome: Students will be able to improve Language in a holistic way through application, differentiation, organization and creation of their own composition in writing skills.

Outcomes:
CO1: To identify a sound understanding on the formation of words and to demonstrate the functional grammatical component in the sentence. (IV analyze)
CO2: To paraphrase ideas and thoughts in a coherent, neat and organized manner in order to utilize the writing skills for sound writing propagandas. (II understand)
CO3: To create an understanding on Indian Literature, alongside to develop and chisel their communication skills. (VI create)
CO4: To recognize the moral element which underlies in the short story; an exposure to informal language. (I knowledge)
CO5: To develop listening and speaking skills through effective sentence constructions and efficient delivery. (VI create)

UNIT I **9 Hrs**
Biography
From the text "Mokshagundam Visvesvaraya"
Explanation of the text, 2
- Grammar –--- Conjunctions, Adverbs 2
- Vocabulary ----- Prefixes and Suffixes 2
- Writing Skill ------Paragraph Writing 2
- Speaking Skill—Role Plays 1

UNIT II **9 Hrs**
Health
From the text "Three Days to See"
Explanation of the text 1
- Grammar -------Usage of Modal Auxiliary Verbs 2
- Vocabulary --- Collective Nouns, Technical Vocabulary 2
- Writing Skill ------Report Writing 2
- Speaking Skill -----Jam 2

UNIT III **9 Hrs**
Short Story
From the text "Leela's Friend" by R.K. Narayan
- Explanation of the text 2
- Grammar----Phrasal Verbs, Wh- Questions 2

- Vocabulary----Noun and Verb Suffixes 2
- Writing Skill------Writing a Narrative 2
- Speaking Skill --- Debates 1

UNIT IV **9 Hrs**

Inspiration

From the text "The Last Leaf" by O. Henry

- Explanation of the text 2
- Grammar----- Prepositions 2
- Vocabulary-----Idioms 2
- Writing Skill----- Précis Writing 2
- Speaking Skill--- Presentations 1

UNIT V **9 Hrs**

Human Interest

From the text" The Convocation Speech"

Explanation of the text 2

- Grammar---- Active and Passive Voice 2
- Vocabulary-----One-word Substitutes 2
- Writing skill------ Essay Writing 2
- Speaking Skill---- Group Discussion 1

ESSENTIAL READING

Epitome of Wisdom, Maruthi Publications.

SUGGESTED READING

1. Krishna Mohan and Meera Banerjee, 1990.**Developing Communication Skills.** New Delhi: Macmillan India Ltd.
2. Krishnaswamy.N. and Sriraman, T. 1995. **Current English for Colleges.** Chennai: Macmillan India Ltd.
3. Narayanaswamy, V.R. 1979. **Strengthen Your Writing.** New Delhi: Orient Longman.
4. Sharma, R.C. and Krishna Mohan. 1978. **Business Correspondence.** New Delhi: Tata McGraw-Hill Publishing Co.

INDIAN HERITAGE & CULTURE
(AECC – IV)

Credits : 2 **Semester: II**

Subject Code : IC19201 **No. of lecture hours: 30**

Objectives:
- To apprise the students with a sound background of Indian Culture.
- To equip the students with social & community problems of India.
- To prepare the student for civil service exams where Indian Heritage & Culture paper is compulsory for all the streams.

Outcome:
CO1: The student can understand better about the origin of ancient Indian culture and the contributions of great rulers from both north and south India for Indian culture in ancient days
CO2: Students will analyze how Persian culture entered into India and how it influenced the Fine Arts of Indian society like Classical Music, Dance and Architecture.
CO3: Student can able to assess how the Indian orthodox society turn into modern and western society in the 19th century. It also edifies the students with spiritual doctrines of various Religions.
CO4: Students will evaluate various challenges face by the youth and the evil affects of terrorism on society
CO5: The topics in the unit create belongingness among the students by bringing awareness of the rights and duties to make the world a better place and it throw light on gender sensitization issues of women, Children and LGBT.

UNIT I **6 Hrs**
INTRODUCTION – IMPACT OF GEOGRAPHY ON INDIAN CULTURE
- Meaning of culture – Characteristics of Indian Culture and Caste system
- Indus Valley Civilization and Vedic/Aryan Culture
- Golden Age of Indian Culture– Mauryas and Guptas, Satavahavas, Pallavas, Cholas.

UNIT II **6 Hrs**
MEDIEVAL INDIA – INFLUENCE OF ISLAM ON INDIAN CULTURE
- Cultural Development under the Delhi Sultanate and Mughals
- Contribution of Sher Shah and Akbar to Indian Administrative System
- Cultural Achievements of Kakatiya and Vijayanagara rulers
- Indian Fine Arts –Painting, Music, Dance and Sculpture

UNIT III **6 Hrs**
IMPACT OF WEST AND REFORM MOVEMENTS
- Influence of Western culture on Indian Society
- 19th century Socio Religious Reform Movement –Raja Ram Mohan, Ishwara Chandra Vidyasagar and Veerasalingam
- Rise of Subaltern Movements in India– Jyothirao Phule-Savitribai Phule, E.V Ramaswamy Naikar –Narayana Guru-Dr. B.R. Ambedkar
- Rise of Indian National movement-Moderate, Extremist and Gandhian Era

UNIT IV **6 Hrs**

IMPACT OF RELIGION AND COSTITUTIONAL INSTITUTIONS

- Hinduism – Islam – Christianity – Jainism and Buddhism -Sikhism – Zoroastrianism
- Democratic system in India- -Parliament and Judiciary- Election Commission
- Impact of Press and Social Pressure groups on Indian Culture
- Know your Rights – Classification of Rights and Importance

UNIT V **6 Hrs**

IMPACT OF CONTEMPORARY GENDER ISSUES

- Woman and Child rights- Violence against Women and Children
- Gender issues - LGBT
- Youth Unrest and Reasons- Alcoholism, Drug Addiction and other Addictions
- Terrorism - Causes and Consequences

REFERENCE BOOKS:

1. Jha, Dr K.N. 2006. **Studies in ancient & Medieval India**. COSMOS Book hive Ltd: Gurgaon.
2. Mahajan, V.D. 2008. **Ancient India**. S.Chand, New Delhi.
3. Manasseh, Dr P. 2010. **An Overview of Indian Culture**. Gamaleil Publishers, Hyderabad.
4. Malpani, Madanlal & Malpani, Shamsunder. 2014. **Indian Heritage and Culture**. Kalyani Publishers, Ludhiana.
5. Mhaske, Dr R.H. 2012. **Human Rights, Social Justice and Political Challenges**. Chandralok Prakashau, Kanpur.
6. Singh, Gurdip & Ahuja, V.K. 2012. **Human Rights in 21st Century**. Universal Law Publisher, New Delhi.

COMPUTER ARCHITECTURE
(SEC – I)

Credits : 4 **Semester: II**

Subject Code : MS19201 **No. of Lecture hours: 75**

Objectives:

- To understand basic digital components.
- To understand the Instruction Set Architecture: Instruction format, types, various addressing modes
- To understand memory organization.
- To understand the basic components and design of the CPU

Outcomes: Students will be able to understand various digital components of a computer and memory organization.
At the end of the course, the student will be able to

CO1: Demonstrate knowledge of register organization of a basic computer system
CO2: Understand the machine language of a basic computer system.
CO3: Incorporate In-depth understanding of control unit organization and micro programmed control.
CO4: Apply various algorithms to perform arithmetic operations and propose suitable hardware for them.
CO5: Analyze and emphasize various communication media in the basic computer system using design of various memory structures.

UNIT-I **15Hrs**

DIGITAL LOGIC CIRCUITS

1. Digital Computers and Logic gates 2
2. Boolean Algebra and Map Simplification 2
3. Combinational Circuits 2
4. Flip Flops 2

DATA REPRESENTATION

5. Data types and Complements 2
6. Fixed and Floating point representation 2
7. Other binary codes and Error Detection codes 3

UNIT-II **15Hrs**

DIGITAL COMPONENTS

1. Integrated Circuits and Decoders 1
2. Multiplexers 1
3. Registers and Shift Registers 1
4. Memory Unit 1

REGISTER TRANSFER AND MICROOPERATIONS

5. Register transfer language and register transfer 1
6. Bus and Memory transfer 1
7. Arithmetic Micro-operations 3

8. Logic Micro-operations	3
9. Shift Micro-operations and Arithmetic Logic Shift Unit	3

UNIT-III **15Hrs**

BASIC COMPUTER ORGANIZATION AND DESIGN

1. Instruction Codes	2
2. Computer Registers	3
3. Computer Instructions Timing and Control	2
4. Instruction Cycle	3
5. Memory Reference Instructions	3
6. Input-Output and Interrupt	2

UNIT-IV **15Hrs**

CENTRAL PROCESSING UNIT

1. Introduction, General Register Organization	2
2. Instruction Formats and Addressing modes	3
3. Data Transfer and Manipulation, Program Control	3

COMPUTER ARITHMETIC

4. Addition and Subtraction	2
5. Multiplication Algorithms	2
6. Division Algorithm	3

UNIT-V **12Hrs**

MEMORY ORGANIZATION

1. Memory Hierarchy	3
2. Main Memory	2
3. Auxiliary Memory	2
4. Associative Memory	2
5. Cache Memory	2
6. Virtual Memory	2
7. Memory Management Hardware	2

ESSENTIAL READING

1. Mano, Morris. 2007. **Computer System Architecture.** 3rd edition. Pearson Education. India: New Delhi.

DIFFERENTIAL EQUATIONS

(Core course – 4)

Credits : 5 **Semester: II**

Subject Code : MS22202 **No. of Lecture hours: 75**

Objectives: To impart basics and solving differential equations applications of differential equations and to evaluate line, Surface and volume integrals.

Outcome:

CO1: Understand the basic idea of Differential equation and apply the knowledge of Differential equations to solve the real life problems.
CO 2: Solve the first order Differential equations using different types of method, especially linear differential equations and Bernoulli equations.
CO 3: Solve differential equations of first order using numerical and analytical methods such as Integrating Factors.
CO4: **Analyze** and Solve basic application problems described by first order differential equations such as orthogonal trajectories.
CO5: **Solve** second order Homogeneous Equations with Constant and Variable Coefficients.

UNIT-I **15 Hrs**

Differential Equations of the first order and first degree:

Introduction - Equations in which Variables are Separable	3
Homogeneous Differential Equations	3
Differential Equations Reducible to Homogeneous Form	3
Linear Differential Equations –	3
Differential Equations Reducible to Linear Form	3

UNIT-II **15 Hrs**

Differential Equations of the first order and first degree:

Exact differential equations – Integrating factors –	7
Orthogonal trajectories - Cartesian coordinates- Polar coordinates.	4
Growth and Decay - Dynamics of Tumor Growth	2
Radioactivity and Carbon Dating - Compound Interest	2

UNIT-III **15 Hrs**

Differential Equations of the first order but not of first degree:

Equations solvable for p	4

Equations solvable for y 4

Equations solvable for x 4

Equations that do not contain x (or y) 3

Equations of the first degree in x and y – Clairaut's equation.

UNIT IV **15 Hrs**

Higher order Linear Differential Equations:

Solution of homogeneous linear differential equations with constant coefficients: 7

Auxiliary equation, complementary function, particular integral

Solution of non-homogeneous differential equations P (D)y = Q(x)

with constant coefficients by means of polynomial Q(x)= e^{ax}, Sinax, Cosbx, x^m, $e^{ax}v$. 8

UNIT V **15 Hrs**

The Cauchy - Euler Equation - Legendre's Linear Equations 3

Miscellaneous Differential Equations. 3

Linear Equations with variable coefficients:

Complete solutions in terms of one known integral belonging to the complementary function 2

Transformation of the equation by changing the independent variable 3

Method of variation of parameters 4

ESSENTIAL READING

1. Zafar Ahsan 2006 **Differential Equations and Their Applications** Second Edition New Delhi: Prentice Hall of India Ltd. (For Units III, IV, & V)

PROBABILITY DISTRIBUTTIONS
(Core Course-5)

Credits : 4 **Semester: II**

Subject Code : BS22211 **No. of Lecture Hours: 75**

Objectives: To prepare students for lifelong learning and successful careers using their statistical skills. Statistical information covers different subject areas (economic, demographic, social etc.). It provides basic information for decision making, evaluations and assessments at different levels.

Outcome:

CO1: **Use** discrete and continuous probability distributions, including requirements, mean and variance, and making decision.
CO2: **Identify** the characteristics of different discrete distributions.
CO3: **Apply** the normal probability distribution including standard normal curve calculations of appropriate areas.
CO4: **Choose** exponential, beta and Gamma distributions to solve statistical problems.
CO5: **Understand** different characteristics of exact sampling distributions.

UNIT-I	**15Hrs**
Discrete Distributions - I:	
Uniform, Bernoulli	2
Binomial	3
and Poisson distributions – Properties of these distributions	3
(such as m.g.f., c.g.f, and p.g.f, characteristic function.)	
moments up to fourth order and their real life applications	2
Reproductive property wherever it exists	2
Poisson approximation to Binomial distributions	3

UNIT-II	**15Hrs**
Discrete Distributions - II:	
Negative Binomial	4
Geometric and Hyper	4
Geometric (mean and variance only) distributions.	
Properties of these distributions such as m.g.f., c.g.f, and p.g.f, characteristic function,	
Moments up to fourth order and their real life applications	
Reproductive property wherever it exists	2
Binomial approximation to Hyper-Geometric	3
Poisson approximation to negative Binomial distributions.	2

UNIT-III	**15Hrs**
Continuous distributions - I:	
Rectangular and Normal distributions	4
Normal distribution as limiting case of Binomial and Poisson distributions	3
Properties of these distributions such as m.g.f., c.g.f, and characteristic function	3
Moments up to fourth order and their real life applications	3
Reproductive property wherever it exists	2

UNIT-IV **15Hrs**

Continuous distributions - II:

Exponential, Gamma	6
Beta of two kinds: definitions, mean and variance	3
Properties of these distributions such as m.g.f., c.g.f, and characteristic function moments up to fourth order and their real-life applications	3
Reproductive property wherever it exists.	3

UNIT-V **15Hrs**

Exact sampling distributions	2
Statement and properties of $\chi 2$	2
Mean variance and additive property of $\chi 2$	2
Statement and properties of t	2
Mean variance and MGF of t	2
Statement and properties of F	2
Mean variance and additive property of F	2
interrelationships between t and F and F and $\chi 2$	1

ESSENTIAL READING

1. V. K. Kapoor and S. C. Gupta 2007. **Fundamentals of Mathematical Statistics.** New Delhi: Sultan Chand & Sons.

SUGGESTED READING

1. M. Jagan Mohan Rao and Papa Rao.2010 **A Textbook of Statistics Paper-I.** Deepti Publications Tenali.
2. Walpole 2005 **Introduction of Probability theory** 7th edition. New Delhi: Pearson Publication.
3. Sanjay Aurora and Bansilal 2006 **New Mathematical Statistics** New Delhi: Pearson Publication.
4. Goon AM, Gupta MK, Das Gupta B.2007 **Fundamentals of Statistics Vol-I**. Kolkata: The world press Pvt. Ltd.
5. William Feller Introduction to '**Probability Theory and its applications'** Volume I New Delhi: Pearson publications.
6. Sanjay Arora and Bansilal **'New Mathematical Statistics'** New Delhi: Satya Prakashan
7. Hoel P.G **'Introduction to Mathematical Statistics'** New Delhi: Asia Pub. House.

C++ WITH DATA STRUCTURES
(Core Course-6)

Credits : 4 **Semester II**

Code : BS22 **No. Of Lecture Hours: 75**

Objectives:

- To understand and develop basic notions of object-oriented programming through C++.
- To understand the concepts of various Data Structures and their algorithms.

Outcome:

CO1: Differentiate between object-oriented programming and procedure-oriented programming.
CO2: Develop programs using object-oriented programming features.
CO3: Organize the data using sorting and various linear data structures and determine the time complexity
CO4: Illustrate the non-linear data structures like trees, graphs.
CO5: Choose appropriate data structures to represent data items in real world problems

UNIT-I **15Hrs**

Introduction to object-oriented programming: Features of OOP's, applications of OOP's 2
Keywords, data types, variables and their declaration, reference variables, Scope resolution, Member dereferencing & memory management operators, manipulators, input and output objects (cin & cout) 2
Functions: Definition, Function components, call by value, reference & address, Inline functions, functions with default arguments, function overloading 5
Defining classes, defining member functions, nesting of member functions, private member functions, Memory allocation for objects, static data members and member functions 5
Objects and Returning objects 1

UNIT-II **15Hrs**

Constructors, default and parameterized constructors, copy constructors, Constructor overloading, constructors with default arguments, Destructors 3
Inheritance: Defining derived classes, single inheritance, making private members Inheritable, multilevel, multiple, hierarchical and hybrid inheritances 3
Virtual base classes, constructors in derived classes, abstract classes 2
Pointers to objects, this pointer, pointers to derived classes, virtual functions, Pure virtual functions 3
Operator overloading using member functions and friend functions and template functions and template classes 5

UNIT-III **15Hrs**

Introduction to data structures: Linear and non-linear data structures, Stacks-Definition, implementing stack using arrays 3
Applications of stack: infix, prefix and postfix expressions, conversion of infix to prefix and infix to postfix, 2
Evaluation of postfix expression 2

Queues- Definition, implementing queue using arrays, circular queue and double ended queue 5
Sparse Matrix-definition, representation of sparse matrix in 3-tuple form 3

UNIT-IV **15Hrs**
Linked list- Definition, single linked lists, operations on single linked list (insertion & deletion), Stack and queue using linked list 5
Trees- Definition, linked representation of trees, Binary search tree, Tree Traversals (inorder, preorder and post order traversals) 3
Linear search and binary search 2
Sorting-Bubble, selection, insertion, quick and merge sort techniques 5

Unit-V **15Hrs**
Btrees-insertion and deletion operations on Btrees 6
Graphs: Definition, Array and linked list representation of graphs 2
Graph traversals-BFS and DFS 4
Spanning tree and Krushkals algorithm 3

ESSENTIAL READINGS:

1. **Object Oriented Programming with C++,by** Reema Thareja, Oxford University Press, 2015.
2. Balaguruswamy, E. 2004. **Object Oriented Programming with C++**. 4th Edition. New Delhi: Tata McGraw-Hill publication (for units I and II).
3. Kanetkar Yashwant, P. 2007. Data Structures through C++. 3nd Edition. New Delhi: BPB Publications (For units III, IV and V)

SUGGESTED READING:

1. Ravichandran, D 2017. **Programming with C++.** 3rd Edition. New York: McGraw Hill.
2. Stroustrup Bjarne 2013. **The C++ Programming Language.** 4th Edition. New York: Addison-Wesley Professional.
3. Sahini Sartaj. 2005. **Data Structures and Algorithms in C++.** 2nd Edition. India: Universities Press Private Limited

PROBABILITY DISTRIBUTTIONS PRACTICALS
(Core Course-5)

Credits : 1 **Semester: II**

Subject Code : BS22212 **No. of Practical Hours: 30**

Objectives: To prepare students for lifelong learning and successful careers using their statistical skills. Statistical information covers different subject areas (economic, demographic, social etc.). It provides basic information for decision making, evaluations and assessments at different levels.

Outcome: Students will be able to apply different distributions in a variety of decision-making situations.

LIST OF PRACTICALS

1. Fitting of Binomial distribution – Direct method.
2. Fitting of Binomial distribution – Direct method using Office Automation.
3. Fitting of Binomial distribution – Recurrence relation method.
4. Fitting of Poisson distribution – Direct method.
5. Fitting of Poisson distribution – Direct method using Office Automation.
6. Fitting of Poisson distribution –Recurrence relation method.
7. Fitting of Negative Binomial distribution.
8. Fitting Hyper-Geometric distribution
9. Fitting of Geometric distribution
10. Fitting of Normal distribution – Areas method
11. Fitting of Normal distribution – Ordinates method
12. Fitting of Exponential distribution.
13. Fitting of Exponential distribution using Office Automation.
14. Fitting of Cauchy distribution.
15. Fitting of Cauchy distribution using Office Automation.

C++ AND DATA STRUCTURES PRACTICALS
(Core Course-6)

Credits : 1 **Semester: II**

Subject Code : BS19204 **No. of Practical Hours: 30**

Objective: To understand object oriented programming concepts in C++ and data structures

Outcome: Students are able to write programs using Object oriented features and ability to identify and implement the appropriate data structures for the given problems.

List of Practical:

1.	Basic C++ programs using operators, loops and decision.
2 – 3.	Programs using class and object.
4	Programs on inline functions, friend functions.
5 – 6	Programs on constructors, overloading on constructors.
7	Programs on inheritance and files.
8	Programs on operator overloading and templates
9	Programs on exceptional handling and arrays.
10 – 11	Programs on stack and queues – array and linked list
12	Programs on application on stacks
13	Programs on sorting and searching
14	Programs on single linked list – operators
15	Programs on graph traversals.