

**Learning Outcomes based Curriculum Framework
(LOCF)**

For

**B.Sc. Data Science
(Four Year Degree Programme)
w.e.f. Session 2021-22**



**University School for Graduate Studies
Chaudhary Devi Lal University
Sirsa-125055, Haryana
2021**

Table of Contents

1. About the University School for Graduate Studies (USGS)
2. Learning Outcomes based Curriculum Framework
 - 2.1 Objectives of the Programme
 - 2.2 Programme Outcomes (POs)
 - 2.3 Programme Specific Outcomes (PSOs)
3. Programme Structure

1. About University School for Graduate Studies (USGS)

National Education Policy (NEP) -2020 has provided an impetus to the changing horizons of Higher Education. Chaudhary Devi Lal University Sirsa has recently established University School for Graduate Studies (USGS) in Teaching Block-IV (Dr. APJ Abdul Kalam Bhawan) of the university in order to start new programmes and courses for tuning ourselves to the latest state-of-the-art in Higher Education. The University School for Graduate Studies (USGS) will focus on strengthening graduate studies especially in the wake of NEP-2020 and will focus on designing, developing and execution of market/industry demand-oriented Four Year Degree Programmes (FYDP). To benefit students, society and faculty, the USGS is destined to start graduate programmes based on Learning Outcomes Curriculum Framework and as per NEP-2020 such as: (i) B.Com. Banking & Insurance, (ii) B.Com. Fintech & Financial Markets, (iii) B.Com. Derivatives & Risk Management, (iv) B.Sc. Data Science, (v) B.Sc. Mathematics, (vi) B.Sc. Physics, (vii) B.A. Economics & Finance. In addition, there is a 1-year programme namely (viii) Bachelor of Library & Information Science. The holistic development of the students to compete the changing scenario of the world in the 21st century is of prime importance. The University School for Graduate Studies is committed to impart quality education comprising academic knowledge and technical skills to the students.

2. Learning Outcomes based Curriculum Framework

The Choice Based Credit Scheme (CBCS) evolved into learning outcome-based curriculum framework and provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill-based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Grading system provides uniformity in the evaluation and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations which enables the student to move across institutions of higher learning. The uniformity in evaluation system also enables the potential employers in assessing the performance of the candidates.

2.1 Objectives of the Programme

The objective of B.Sc. Data Science Four Year Degree Programme is to impart deep knowledge and technical skills of Data Science to the students.

Programme Outcomes (POs)	
On successful completion of B.Sc. in Data Science	
PO1	Exhibit good domain knowledge and completes the assigned responsibilities effectively and efficiently in par with the expected quality standards.
PO2	Apply analytical and critical thinking to identify, formulate, analyze, and solve complex problems in order to reach authenticated conclusions
PO3	Design and develop research based solutions for complex problems with specified needs through appropriate consideration for the public health, safety, cultural, societal, and environmental concerns.
PO4	Establish the ability to Listen, read, proficiently communicate and articulate complex ideas with respect to the needs and abilities of diverse audiences.
PO5	Deliver innovative ideas to instigate new business ventures and possess the qualities of a good entrepreneur
PO6	Acquire the qualities of a good leader and engage in efficient decision making.
PO7	Graduates will be able to undertake any responsibility as an individual/member of multidisciplinary teams and have an understanding of team leadership
PO8	Function as socially responsible individual with ethical values and accountable to ethically validate any actions or decisions before proceeding and actively contribute to the societal concerns.
PO9	Identify and address own educational needs in a changing world in ways sufficient to maintain the competence and to allow them to contribute to the advancement of knowledge.
PO10	Demonstrate knowledge and understanding of management principles and apply these to one own work to manage projects and in multidisciplinary environment.

Programme Specific Outcomes (PSOs)	
After the successful completion of B.Sc. in Data Science program the students are expected to	
PSO1	Impart education with domain knowledge effectively and efficiently in par with the expected quality standards for Data analyst professional.
PSO2	Ability to apply the mathematical, technical and critical thinking skills in the discipline of Data analytics to find solutions for complex problems.
PSO3	Ability to engage in life-long learning and adopt fast changing technology to prepare for professional development.
PSO4	Expose the students to key technologies in data science and business analytics: data mining, machine learning, visualization techniques, predictive modeling, and statistics.
PSO5	Inculcate effective communication skills combined with professional & ethical attitude.

Type of Course	No. of Courses	Total Credits
CC- Core Course	37	136
DSC- Discipline Specific Elective Course	06	24
SEC- Skill Enhancement Course	08	08
GEC- Generic Elective Course	06	24
AECC- Ability Enhancement Compulsory Course	02	08
		Grand Total: 200

Table 1: Courses and Credit Scheme

Semester	Core Courses (CC)		Discipline Specific Elective Courses (DSC)		Skill Enhancement Courses (SEC)		Ability Enhancement Compulsory Courses (AECC)		Generic Elective Courses (GEC)		Grand Total Credits (2+4+6+8+10)
	1	2	3	4	5	6	7	8	9	10	
	No. of Courses	Total Credits	No. of Courses	Total Credits	No. of Courses	Total Credits	No. of Courses	Total Credits	No. of Courses	Total Credits	
I	4	12	-	-	1	1	1	4	2	8	25
II	5	16	-	-	1	1	1	4	1	4	25
III	5	16	1	4	1	1	-	-	1	4	25
IV	5	16	1	4	1	1	-	-	1	4	25
V	5	16	2	8	1	1	-	-	-	-	25
VI	4	12	2	8	1	1	-	-	1	4	25
Total	Core Credits	88	Discipline Specific Elective Credits	24	Skill Enhancement Credits	6	Ability Enhancement Credits	8	Generic Elective Credits	24	150
Percentage (%)	Core Credits	58.66	Discipline Specific Elective Credits	16	Skill Enhancement Credits	4		5.33		16	100
VII	5	16	2	8	1	1	-	-	-	-	25
VIII	1	24	-	-	1	1	-	-	-	-	25
Total	Core Credits	128	Discipline Specific Elective Credits	32	Skill Enhancement Credits	8	Ability Enhancement Credits	8	Generic Elective Credits	24	200
Percentage (%)	Core Credits	64	Discipline Specific Elective Credits	16	Skill Enhancement Credits	4		4		12	100

Table 2: Detailed break-up of Credit Courses

Semester	Core Courses (CC)	Discipline Specific Elective Courses (DSC)	Skill Enhancement Courses (SEC)	Ability Enhancement Compulsory Courses (AECC)	Generic Elective Courses (GEC)	Total Courses (CC+DSC+SEC+AECC+GEC)
I	CC1 CC2 CC3 CC4	-	SEC1	AECC1	GEC1 GEC2	08
II	CC5 CC6 CC7 CC8 CC9	-	SEC2	AECC2	GEC3	08
III	CC10 CC11 CC12 CC13 CC14	DSC1	SEC3	-	GEC4	09
IV	CC15 CC16 CC17 CC18 CC19	DSC2	SEC4	-	GEC5	08
V	CC20 CC21 CC22 CC23 CC24	DSC3 DSC4	SEC5	-	-	08
VI	CC25 CC26 CC27 CC28	DSC5 DSC6	SEC6	-	GEC6	08
VII	CC29 CC30 CC31 CC32 CC33	DSC7 DSC8	SEC7	-	-	08
VIII	CC34 Research (Dissertation/ Project/Product development/etc.)	-	SEC8	-	-	01

Table 3: Course code and Title along with credits details**SEMESTER-I**

Course Code	Course Type	Course Title	Credit	Int.	Ext.	Total
BDS/1/CC1	CC	Programming Fundamentals using C	4	30	70	100
BDS/1/GEC1	GEC	Computational Thinking	4	30	70	100
EVS/1/AECC1	AECC	Environmental Studies	4	30	70	100
BDS/1/GEC2	GEC	Numerical Methods	4	30	70	100
BDS/1/CC2	CC	Office Automation Tools	4	30	70	100
BDS/1/CC3	CC	Software Lab- 1 (Based on Programming in C)	2		50	50
BDS/1/CC4	CC	Software Lab-II (Based on Office Automation Tools)	2		50	50
BDS/1/SEC1	SEC	Seminar	1	25		25

SEMESTER-II

Course No.	Course Type	Course Title	Credit	Int.	Ext.	Total
BDS/2/CC5	CC	Object Oriented Programming with C++	4	30	70	100
BDS/2/CC6	CC	Database Management System	4	30	70	100
ENG/2/AECC2	AECC	Functional English	4	30	70	100
BDS/2/GEC3	GEC	Applied Linear Algebra	4	30	70	100
BDS/2/CC7	CC	Data Structure	4	30	70	100
BDS/2/CC8	CC	Software Lab- 1 (Based on Data Structure using C++)	2		50	50
BDS/2/CC9	CC	Software Lab-II (Based on Database Management System)	2		50	50
BDS/2/SEC2	SEC	Seminar	1	25		25

Note: Students shall undergo the internship during summer vacation after the completion of IInd Semester and before the commencement of IIIrd Semester classes for a period of 4-6 weeks.

SEMESTER-III

Course No.	Course Type	Course Title	Credit	Int.	Ext.	Total
BDS/3/GEC4	GEC		4	30	70	100
BDS/3/CC10	CC		4	30	70	100
BDS/3/CC11	CC		4	30	70	100
BDS/3/CC12	CC		4	30	70	100
BDS/3/CC13	CC		2	-	50	50
BDS/3/CC14	CC		2	-	50	50
BDS/3/DSC1	DSC		4	-	-	100
BDS/3/SEC3	SEC	Seminar	1	25		25

SEMESTER-IV

Course No.	Course Type	Course Title	Credit	Int.	Ext.	Total
BDS/4/CC15	CC		4	30	70	100
BDS/4/CC16	CC		4	30	70	100
BDS/3/GEC5	GEC		4	30	70	100
BDS/4/CC17	CC		4	30	70	100
BDS/4/DSC2	DSC		4	30	70	100
BDS/4/CC18	CC		2	-	50	50
BDS/4/CC19	CC		2	-	50	50
BDS/4/SEC4	SEC	Seminar	1	25	-	25

SEMESTER-V

Course No.	Course Type	Course Title	Credit	Int.	Ext.	Total
BDS/4/CC20	CC		4	30	70	100
BDS/4/CC21	CC		4	30	70	100
BDS/4/CC22	CC		4	30	70	100
BDS/4/DSC3	DSC		4	30	70	100
BDS/4/DSC4	DSC		4	30	70	100
BDS/4/CC23	CC		2	-	50	50
BDS/4/CC24	CC		2	-	50	50
BDS/4/SEC5	SEC	Seminar	1	25	-	25

Elective-I

- a)
- b)
- c)

SEMESTER-VI

Course No.	Course Type	Course Title	Credit	Int.	Ext.	Total
BDS/5/CC25	CC		4	30	70	100
BDS/5/CC26	CC		4	30	70	100
BDS/5/GEC6	GEC		4	30	70	100
BDS/5/DSC5	DSC		4	30	70	100
BDS/5/DSC6	DSC		4	30	70	100
BDS/5/CC27	CC		2		50	50
BDS/5/CC28	CC		2		50	50
BDS/5/SEC6	SEC	Seminar	1	25		25

Elective – I

- a)
- b)
- c)

Elective – II

- a)
- b)
- c)

SEMESTER-VII

Course No.	Course Type	Course Title	Credit	Int.	Ext.	Total
BDS/4/CC29	CC		4	30	70	100
BDS/4/CC30	CC		4	30	70	100
BDS/4/CC31	CC		4	30	70	100
BDS/4/DSC7	DSC		4	30	70	100
BDS/4/DSC8	DSC		4	30	70	100
BDS/4/CC32	CC		2		50	50
BDS/4/CC33	CC		2		50	50
BDS/4/SEC7	SEC	Seminar	1	25		25

Elective-I

- a)
- b)
- c)

SEMESTER-VIII

Course No.	Course Type	Course Title	Credit	Int.	Ext.	Total
BDS/6/CC34	CC	Dissertation/Project/etc.	20	-	-	-
BDS/6/SEC8	SEC	Seminar	01	25	-	25

Table 4: Generic Elective Courses offered by Department of Computer Science for the Students of other departments

Course Code	Course Title	Credits
Semester -I		
BDS/1/GEC1	Office Automation Tools (Theory)	4
BDS /2/GEC2	Office Automation Tools (Practical)	2
Semester -II		
BDS /2/GEC3	Database Management System (Theory)	4
BDS /2/GEC4	Database Management System (Practical)	2

Semester-I

BDS/1/CC1 - Programming Fundamentals using C

Final Term Exam marks: 70
Internal Assessment: 30
Duration of Exam.: 3 Hrs

Credits	
L	P
4	2

Course Objectives: To introduce the concepts of Procedure Oriented Programming and the various programming constructs of C programming.

Course Outcomes: Apply the concept of Decision making statements and looping constructs for solving basic programs. Use the concepts of files and pointers inside a C program.

***Note for the Paper Setter:** The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition, eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.*

Unit 1

Programming fundamentals: problem definition, algorithms, flow charts and their symbols, introduction to compiler, interpreter, debuggers, assembler, linker and loader and their inter relationship, Machine-, Assembly-, High Level- Language.

Unit 2

Elements of C: Character set, identifier and keywords, data type, declaration and definition, formatted input/ output, expressions.

Operators: Arithmetic, relation, logical, bit wise, unary, assignment and conditional operators their hierarchy and associativity.

Unit 3

Control statements: selection, sequencing, if and switch statement, Repetition for, while loops, do-while loop, break, continue, goto.

Unit 4

Arrays, functions, including recursive functions, program organization: local and external variables and scope; pointers & arrays.

Strings: strings literals, string variables, I/O of strings, arrays of strings; applications.

Text Books:

1. Using Information Technology, 5th Edi, Brian K Williams & Stacey C. Sawyer, 2003, TMH
2. The C Programming Language by Dennis M Ritchie, Brian W. Kernighan, 1988, PHI.
3. C Programming – A modern approach by K.N. King, 1996, WW Norton & Co.

BDS/1/GEC1 - Computational Thinking

Final Term Exam marks: 70
Internal Assessment: 30
Duration of Exam.: 3 Hrs

Credits	
L	P
4	0

Course Objectives: thinking or solving problems like computer scientists. CT refers to thought processes required in understanding problems and formulating solutions. CT involves logic, assessment, patterns, automation, and generalization.

Course Outcomes: Computational thinking allows us to take a complex problem, understand what the problem is and develop possible solutions. We can then present these solutions in a way that a computer, a human, or both, can understand.

Note for the Paper Setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition, eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

Unit 1

Introduction: Computer, evolutions and classification, components.

Software: Introduction, types of software, operating system and its types, languages and its types, translator and its types.

Hardware: Introduction, types, pointing and positioning devices, firmware.

Unit 2

Input devices: keyboard, point and draw devices, direct data input devices.

Output devices: hard and soft copy (CRT and Flat panel display) output devices.

Unit 3

Number System: Binary Numbers, Octal Number, Decimal Number & HexaDecimal.

Program planning tools: Programming languages, Flowcharts, Algorithms, Pseudo code, decision table, decision tree.

Unit 4

Networks: Introduction, The Internet, Local and Wide Area Networks, Wireless Networking, A Brief Introduction of Network Models and Protocols.

Web: Introduction, A Brief History of Web, Web Server, Web Browser, URLs, Basics of Static and Dynamic Web Pages, Web Search Engine and Web Services.

Text Books:

1. Wang, Paul S. From Computing to Computational Thinking. United Kingdom, CRC Press, 2017.
2. Riley, David D., and Hunt, Kenny A. Computational Thinking for the Modern Problem Solver. United States, Taylor & Francis, 2014.

Reference Books:

1. Kanetkar, Yashavant. Let Us C Solutions. India, BPB Publications, 2018.
2. Forouzan, Behrouz, and Fegan, Sophia Chung. Data Communications Networking McGraw-Hill.
3. Rivest, Ronald L., et al. Introduction to Algorithms. United Kingdom, McGraw-Hill, 2009.
4. Data Structures and Algorithms. India, Pearson Education.

EVS/1/AECC1 - Environmental Studies

Credits: 4 (Theory)

Lectures: 60

Duration of Exam.: 3 Hrs.

Max. Marks: 100

Final Term Exam.: 70

Internal Assessment: 30

Course Objective: Students will understand how science and the scientific methods work to address environmental problems. The students will become familiar with the Earth's major systems, how they function and how they are affected by human?

Course Outcomes: After completing the course in Environmental Studies, students will be able to: Demonstrate an integrated approach to environmental issues with a focus on sustainability; Use critical thinking, and methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving.

Note for the Paper Setter: The question paper will consist of five questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition, four more questions will be set unit-wise comprising of two questions from each of the two units. The candidates are required to attempt two more questions selecting at least one question from each unit.

UNIT I

The multidisciplinary nature of environmental studies: Definition, Scope and importance need for public awareness. Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources; Growing energy needs, renewable and non-renewable energy sources, case studies. Land resources: Land as a resource, land degradation man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT II

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem. Producers, Consumers and decomposers. Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, Characteristic features, structure and function of the following of the ecosystem: Forest ecosystem, Grass land ecosystem, desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity and its conservation: Introduction-Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of diversity: consumptive use, productive use, social, ethical; aesthetic and option calls. Biodiversity at global, National and local levels. India as a mega- diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemics. Conservation of biodiversity: In-situ and Ex-situ, Conservation of biodiversity.

UNIT III

Environmental Pollution: Definition-Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster Management: floods, earthquake, cyclone and landslides.

Social Issues and the environment: From Unsustainable to Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Air (prevention and Control of Pollution) Act. Water (prevention and control of pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

UNIT IV

Human Population and the Environment: Population growth, variation among nations. Population explosion- family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV/AIDS. Women and child welfare, role of information technology in environment and human health, Case Studies.

Field work: Visit to a local area to document environmental assets: river/forest grass land/hill/mountain, Visit to a local polluted site-Urban/Rural/Industrial/ Agricultural, Study of common plants, insects, birds. Study of simple ecosystems pond, river, hill slopes, etc.

Suggested Readings:

1. Agarwal, K.C. 2001 *Environmental Biology*, Nidhi Publ. Ltd. Bikaner.
2. Bharucha Erach, *The Biodiversity of India*, Mapin Publishing Pvt. Ltd., Ahmedabad- 380013, India.
3. Clerk RS., *Marine Pollution*; Clarendon Press Oxford.
4. *Down to Earth*, Centre for Science and Environment.
5. Hawkins R.E., *Encyclopedia of Indian Natural History*, Bombay Natural History Society, Bombay.
6. Mhaskar A.K, *Matter Hazardous*, Techno-Science Publications.
7. Townsend C., Harper J, and Michael Begon, *Essentials of ecology*, Blackwell Science.
8. Trivedi R.K and P.K Goel, *Introduction to air pollution*, Techno-Science Publications.
9. Trivedi R.K, *Handbook of Environmental Laws, Rules, Guidelines Compliances and Standards, Vol I and II*, Envirol Media.
10. Wagner KD., 1998. *Environmental Management*. W.B. Saunders Co. Philadelphia, USA.

BDS/1/GEC2 - Numerical Methods

Final Term Exam marks: 70

Internal Assessment: 30

Duration of Exam.: 3 Hrs

Credits

L P

4 0

Course Objective: To deal with various topics like finding roots of equations, solving systems of linear algebraic equations, interpolation and regression analysis, numerical integration & differentiation, solution of differential equation, boundary value problems, and solution of matrix problems.

Course Outcome: Apply Numerical analysis which has enormous application in the field of Science and some fields of Engineering, numerical integration and differentiation, numerical solution of ordinary differential equations.

***Note for the Paper Setter:** The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition, eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.*

Unit 1

Solution of Equations: Numerical methods versus numerical analysis, Errors and Measure of Errors. Solution of equations: iteration method, Newton-Raphson Method, BI-section, false position methods.

Unit 2

Interpolation: Lagrangian interpolating polynomials – interpolation with equal intervals – Newton's forward and backward difference formulae – central difference formulae – interpolation with unequal intervals – divided differences – Newton's divided difference formula.

Unit 3

Numerical Differentiation and Integration: Differentiation using interpolation formulae – numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – two and three point Gaussian quadrature formulae – double integrals using trapezoidal and Simpson's rules.

Unit 4

Measure of central tendency, Preparing frequency distribution table. Mean, arithmetic mean, Harmonic Mean. Median, mode. Measure of dispersion, skewness and kurtosis Ranges, Mean deviation. Standard deviation, co-efficiency of variation, Moments, skewness, kurtosis.

Text books:

1. S.S. Sastry, Introductory Methods of Numerical Analysis, 4th edition, PHI Learning Private Limited, New Delhi, 2007.
2. B.S. Grewal and J.S. Grewal, Numerical Methods in Engineering and Science, 6th edition, Khanna Publishers, New Delhi, 2004.
3. John H. Mathews and Kurtis D. Fink, Numerical Methods using MATLAB, 4th edition, PHI Learning Private Limited, New Delhi, 2007.
4. C.F. Gerald and P.O. Wheatley, Applied Numerical Analysis, 6th edition, Pearson Education, Asia, New Delhi, 2006.
5. R.S.N. Pillai , Statistics (Theory & Practice) , S.Chand Limited, 2010.

BDS/1/CC3 - Office Automation Tools

Final Term Exam marks: 70
Internal Assessment: 30
Duration of Exam.: 3 Hrs

Credits
L P
4 2

Course Objective: Office tools course would enable the students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools. To familiarize the students in preparation of documents and presentations with office automation tools.

Course Outcomes: By learning the course, the students will be able to perform documentation, accounting operations to perform presentation skills.

***Note for the Paper Setter:** The question paper will consists of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition, eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.*

Unit 1

Windows: Installation of Windows, Windows Desktop, My computer, My documents, Network neighbourhood, Recycle Bin, Quick launch tool bar, System tray, Start menu, Task bar - System Tray - Quick launch tool bar - Start button - Parts of Windows, Keyboard Accelerators: Key board short keys or hotkeys, Working with Notepad & WordPad, Creating & Editing Images with Microsoft paint, using the Calculator, Personalising Windows.

Unit 2

MS-Word: Working with Documents, Formatting page & setting Margins, Converting files to different formats, Importing & Exporting documents, Formatting Documents - Setting Font styles, Font selection- style, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering. Setting Page style - Formatting Page, Page tab, Margins, Layout settings, Border & Shading, Columns, Header & footer, Setting Footnotes & end notes, page break, Setting Document styles, Table of Contents, Index, Page Numbering, date & Time, Creating Tables- Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, Drawing - Inserting Clip Arts, Pictures/Files, Tools –Spell Checks, Mail merge, Templates, Printing Documents.

Unit 3

MS-Excel: Spread Sheet & its Applications, Opening Spreadsheet, Menus , Working with Spreadsheets- opening, Saving files, setting Margins, Spread sheet addressing - Rows, Columns & Cells, Referring Cells & Selecting Cells – Shortcut Keys. Entering & Deleting Data, Inserting Data, Insert Cells, Column, rows & sheets, Inserting Functions, Formula - finding total in a column or row, Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation), Formatting Spreadsheets- Labelling columns & rows, Formatting- Cell, row, column & Sheet, Category - Alignment, Font, Border & Shading, Hiding/ Locking Cells, Working with sheets – Sorting, Filtering, Creating Charts , Tools – Error checking, Spell Checks.

Unit 4

MS-Power-Point: Introduction to presentation – Opening new presentation, Different presentation templates, setting backgrounds, selecting presentation layouts. Creating a presentation-Setting Presentation style, Adding text to the Presentation. Formatting a Presentation-Adding style, Colour, Arranging objects, Adding Header & Footer, Slide Background, Slide layout. Adding Graphics to the Presentation- Inserting pictures, tables into presentation, Adding Effects to the Presentation-Setting Animation & transition effect.

Reference Books:

1. Fundamentals of computers - V. Rajaraman - Prentice- Hall of India
2. Microsoft Office 2007 Bible John Walkenbach, HerbTyson, Faithe Wempen, Cary N. Prague, Michael R. Groh, Peter G. Aitken, and Lisa a. Bucki -Wiley India pvt.ltd
2. "Computer Concepts Windows and MS Office", Vikas Publishing House ISBN : 8125912398
3. "MS Office in NutShell" Vikas Publishing House ISBN : 8125914463
4. Rathbone Andy, "Windows XP for Dummies", IDG Books India (Published: 9/2001), ISBN: 8126502282.
5. Tyler, Denise, "Windows XP Home and Professional Editions" BPB Publications (Published: 9/2001).

Semester-II

BDS/2/CC5 - Object Oriented Programming with C++

Final Term Exam marks: 70

Internal Assessment: 30

Duration of Exam.: 3 Hrs

Credits

L P

4 0

Course Objectives: To learn the fundamental programming concepts and methodologies which are essential to building good C++ programs. To practice the fundamental programming methodologies in the C/C++ programming language via laboratory experiences. Microsoft Visual Studio is the programming environment that will be used.

Course Outcomes: To describe the advantages of a high level language like C/C++, the programming process, and the compilation process. To describe and use software tools in the programming process. To apply good programming principles to the design and implementation of C/C++ programs.

Note for the Paper Setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition, eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

Unit 1

Introduction to OOPs and C++ Element: Introduction to OOPs, Features & Advantages of OOPs, Elements of C++ (Tokens, Keywords, Identifiers, Variable, Constant, Operators, Expression, String).

Unit 2

Program Control Statements : Sequential Constructs, Decision Making Construct, Iteration / Loop Construct, Arrays, Functions (User defined Function, Inline Function, Function Overloading), User Defined Data Types (Structure, Union and Enumeration).

Unit 3

Class, Object, Constructor & Destructor: Class, Modifiers (Private, Public & Protected), Data Member, Member Function, Static Data Member, Static Member Function, Friend Function, Object, Constructor (Default Constructor, Parameterized Constructor and Copy Constructor), Destructor.

Unit 4

Pointer, Polymorphism & Inheritance : Pointer (Pointer to Object, this Pointer, Pointer to Derive Class), Introduction to Polymorphism (Runtime Polymorphism, Compile time Polymorphism), Operator Overloading, Virtual Function, Inheritance (Single Inheritance, Multiple Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Hybrid Inheritance), Virtual Base Class, Abstract Class.

Text books:

1. Object Oriented programming with C++ : E. Balaguruswami.
2. Success with C++: Kris James.
3. Object Oriented programming with C++: David Parsons.
4. Programming in C++: D. Ravichandran.
5. Programming in C++: Dewhurst and Stark.
6. Mastering C++: Venugopal, Ravishankar, Rajkumar.

BDS/2/CC6 - Database Management System

Final Term Exam marks: 70
Internal Assessment: 30
Duration of Exam.: 3 Hrs

Credits	
L	P
4	2

Course objectives: To explain basic database concepts, applications, data models, schemas and instances, constraints and relational algebra and normalization.

Course outcomes: Student will apply the basic concepts of Database Systems and Applications. Use the basics of SQL and construct queries using SQL in database creation and interaction.

Note for the Paper Setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition, eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

Unit 1

Basic concepts: a historical perspective, file system vs. DBMS, characteristics of the database approach, abstraction and data integration, database users, advantages and disadvantages of DBMS, implication of database approach.

Database system concepts and architecture- data models, schemas and instances, DBMS architecture and data independence database languages & interfaces, DBMS functions and component modules.

Unit 2

Entity-relationship model: Entity types, entity sets, attributes & keys, relationships, relationship types, E-R diagrams, design of an E-R database schema.

Conventional data models- an overview of network and hierarchical data models.

Relational data model- Relational model concepts, integrity constraints over relations, relational algebra – basic operations.

Unit 3

Relational database design: Functional dependencies, decomposition, desirable properties of decomposition, Normalization, normal forms based on primary keys (1 NF, 2 NF, 3 NF and BCNF).

Unit 4

Transaction processing concepts: introduction to transaction processing, transaction & system concepts, properties of transaction,

Concurrency control techniques: locking techniques, timestamp ordering, multiversion techniques, optimistic techniques.

Recovery techniques: recovery concepts, recovery techniques in centralized DBMS. **Database security:** introduction to database security issues.

Text Books

1. Elmasri & Navathe, Fundamentals of Database System, 3e, Addison Wesley, New Delhi.
2. Korth & Silberschatz, Database System Concept, 4e, McGraw Hill International Edition.

Reference Books

1. C.J. Date, An Introduction to Database System 7e, Addison Western, New Delhi.
2. Abbey Abramson & Cory, ORACLE SI-A Beginner's Guide, Tata McGraw Hill Publishing Company Ltd.

ENG/2/AECC2 – Functional English

Credits: 4 (Theory)

Lectures: 60

Duration of Exam.: 3 Hrs.

Max. Marks: 100

Final Term Exam.: 70

Internal Assessment: 30

Objective: The course aims to introduce students to the theory, fundamentals and tools of communication and to develop in them effective communication skills which should be integral to personal, social and professional interactions. In addition, to develop in them the understanding of the English language.

Learning Outcomes: After completion of the course, learners will:

CO1: have the knowledge of communication.

CO2: have speaking skills in social interactions and communication in professional situations such as interviews, group discussions and office environments,

CO3: have the knowledge and understanding of the language of communication.

CO4: have reading, listening and writing skills.

Note for the Paper Setter: The question paper will consist of five questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition, four more questions will be set unit-wise comprising of two questions from each of the two units. The candidates are required to attempt two more questions selecting at least one question from each unit.

Unit-I

Introduction: Definition and Theory of Communication, Types and modes of Communication. Language of Communication: Verbal and Non-verbal (Spoken and Written); Personal, Social and Business Barriers and Strategies; Intra-personal, Inter-personal and Group communication. Impact of communication on performance.

Unit-II

Speaking Skills: Monologue, Dialogue, Group Discussion, Effective Oral Communication, Miscommunication, Oral Presentation, Interview, Public Speech.

Unit-III

Remedial English: Parts of Speech, Sentences, Subject- Verb Agreement, Active and Passive Voice, Degrees of comparison, Direct and Indirect Speech, Question Tags.

Reading and Understanding: Close Reading, Comprehension, Summary, Paraphrasing, Analysis and Interpretation, Translation (from Indian language to English and vice-versa), Literary/Knowledge Texts.

Unit-IV

Writing Skills: Elements of writing, Documenting, Report Writing, Making notes, Letter writing, Business communications

Listening Skills: Listening and its types, Barriers of effective Listening, Barriers and Strategies for effective listening, Listening to complaints.

Suggested Readings:

1. B.K. Das and A. David, A Remedial Course in English, Book 2, C.I.E.F.L. (O.U.P.) 1980.
2. A.S. Hornby, Oxford Advanced Learner's Dictionary of Current English (O.U.P.) 3, A Textbook of English Phonetics for Indian Students by T. Balasubramanian.
3. Fluency in English - Part II, Oxford University Press, 2006.
4. Business English, Pearson, 2008.
5. Language, Literature and Creativity, Orient Blackswan, 2013.

BDS/2/GEC3 - Applied Linear Algebra

Final Term Exam marks: 70
Internal Assessment: 30
Duration of Exam.: 3 Hrs

Credits	
L	P
4	0

Course Objectives: students will solve systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion. Carry out matrix operations, including inverses and determinants. Demonstrate understanding of the concepts of vector space and subspace.

Course Outcomes: To use mathematically correct language and notation for Linear Algebra. To become computational proficiency involving procedures in Linear Algebra. To understand the axiomatic structure of a modern mathematical subject and learn to construct simple proofs.

***Note for the Paper Setter:** The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition, eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.*

Unit 1

MATRICES: Matrices: Definition, Properties, Basic operations, Determinants of Matrices and applications of determinants for 3rd and Higher order, Inverse of matrix, Trace of matrix, Partition of matrix, Rank of matrix.

Unit 2

Matrices And System Of Linear Equations: Row echelon form, Rank, System of linear equations, Consistency, Gauss elimination method, Gauss Jordan method.

Unit 3

Linear Transformation: Linear transformation, Rank space and null space, Rank and nullity, Dimension theorem, Matrix representation of linear transformation, Eigenvalues and eigenvectors of linear transformation.

Unit 4

Vector Spaces: Definitions and characteristic vectors, Vector Subspaces, Linear Independence, Basis and Dimensions of a Vector Space, Row and Column Spaces of a matrix, Row rank and Column rank.

Text Book(s)

1. Gilbert Strang (2016). Introduction to Linear Algebra, 5th Edition. Wellesley – Cambridge Press.

Reference Book

1. S.Lang (1997). Introduction to Linear Algebra. Second Edition. Springer.
2. Gilbert Strang (2006). Linear Algebra and Its Applications. Fourth Edition. Cengage Learning.
3. David C. Lay, Steven R. Lay, and Judi J. McDonald (2014). Linear Algebra and Its Applications. 5th Edition. Pearson

BDS/2/CC7 - Data Structures

Final Term Exam marks: 70
Internal Assessment: 30
Duration of Exam.: 3 Hrs

Credits
L P
4 2

Course objectives: To impart the basic concepts of data structures and algorithms. To understand concepts about searching and sorting techniques. To understand basic concepts about stacks, queues, lists, trees and graphs.

Course outcomes: Ability to analyze algorithms and algorithm correctness, searching and sorting techniques. Ability to describe stack, queue and linked list operation, tree and graphs concepts.

***Note for the Paper Setter:** The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition, eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.*

Unit 1

Data Structure and algorithm preliminaries: Definitions, Time and Space analysis of Algorithms, Time-Space Tradeoff, Mathematical Notation and functions, Asymptotic Notations for complexity of algorithms, Recursion, Divide and Conquer Strategy

Unit 2

Array - Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation),
Stack -Implementing of stack; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; ,

Unit 3

Queues- Operation on Queues, Circular queue, Priority queues and deQueue,
Linked list – Single, Double, Circular Linked List Implementation.

Unit 4

Trees –Binary tree,Tree Traversals, Binary Search Tree, Threaded Binary Tree ,AVL Trees, Height balanced tree , Heap and its applications.

Searching, Sorting: Searching –Linear Search, Binary Search. Sorting- Bubble sort, Selection sort, Insertion sort, Merge Sort ,Quick Sort, Heap sort,

References:

1. Seymour Lipschutz, Data Structures, McGraw-Hill Book Company, Schaum's Outline series, New York (1986).
2. Narasimha Karumanchi, Data Structures And Algorithms Made Easy, Career Monk.