B.Sc.MATHEMATICS & COMPUTING / B.Sc. (Hons./Hons.with Research) MATHEMATICS& COMPUTING

Scheme and Syllabus

in accordance to NEP 2020

ACADEMIC SESSION
(w.e.f. 2023-2024)

DEPARTMENT OF MATHEMATICS

FACULTY OF SCIENCES

J C BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA, FARIDABAD HARYANA -121006

J. C. BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA, FARIDABAD

VISION

J C BOSE University of Science and Technology, YMCA aspires to be a nationally and internationally acclaimed leader in technical and higher education in all spheres which transforms the life of students through integration of teaching, research and character building.

MISSION

- To contribute to the development of science and technology by synthesizing teaching, research and creative activities.
- To provide an enviable research environment and state-of-the art technological exposure to its scholars.
- To develop human potential to its fullest extent and make them emerge as world class leaders in their professions and enthuse them towards their social responsibilities.

DEPARTMENT OF MATHEMATICS

VISION

To emerge as a department of science, which will provide strong foundations in the areas of Pure and Applied Mathematics in order to develop innovative minds for interdisciplinary research.

MISSION

- To develop strong communication skills among students.
- To develop strong moral values.
- To develop strong foundations in mathematics to have sound analytical and critical thinking ability for innovative solutions in practical problems.
- To continuously improve the basic infrastructure in pursuit of providing the necessary environment for academic excellence.
- To develop a nurturing environment for lifelong learning.

ABOUT THE PROGRAM:
B.Sc. (Hons./Hons. With Research) Mathematics& Computing

The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of the country. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters. The UGC has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Higher Educational Institutions (HEIs) in India. The academic reforms recommended by the UGC in the recent past have led to overall improvement in the higher education system. Keeping this in view, our department is already offering the undergraduate course in Mathematics (B.Sc. Mathematics) since 2018. As we are living the world of science and computers today, therefore, a course in computer science with solid mathematics foundation is the current demand of the society. The data from other institutes (within and outside India) where similar programs are running, indicates that the proposed course is a very successful program and provides a good career opportunities in MNCs related to finance sector, IT sector and in research & development section. Moreover, students may pursue their higher studies in different areas such as M.Sc. in Mathematics, M.Sc. in Computer Science, MCA, MTech., integrated M.Sc. Ph.D. programmes, MBA etc. As mentioned earlier, there are various job opportunities in various fields for the graduates of B.Sc. Mathematics and Computing. Moreover, the graduates will have opportunities for higher studies. In fact as per make in India slogan, the graduates will have opportunities for their own Start-ups. Various other jobs are also available for these graduates in government sector. For example, various exams are being conducted by UPSC every year for recruiting such graduate students to several posts. For that reason this career option is popular among the graduates of B.Sc. Mathematics and Computing.

Awarding UG Certificate, UG Diploma and UG Degrees

UG Certificate: Students who opt to exit after completion of the first year and have secured 52credits will be awarded a UG certificate if, in addition, they complete one vocational Course/summer internship of 4 credits during the summer vacation of the first year. These students are allowed to re-enter the degree programme within three years and complete the degreeprogramme within the stipulated maximum period of seven years.

UG Diploma: Students who opt to exit after completion of the 2nd year and have secured 90 credits will be awarded the UG diploma if, in addition, they complete one vocational Course/summer internship of 4 credits during the summer vacation of the second year. These students are allowed to re-enter within a period of three years and complete the degree programme within the maximum period of seven years.

3-year UG Degree: Students who wish to undergo a 3-year UG programme will be awarded UG Degree in the Major discipline after successful completion of three years, securing 136 credits and satisfying the minimum credit requirement.

4-year UG Degree (Honours): A four—year UG Honours degree in the major discipline will be awarded to those who complete a 4-year degree programme with 184 credits and have satisfied the credit requirements.

4-year UG Degree (Honours with Research): Students who secure 75% marks and above in the first six semesters and wish to undertake research at the undergraduate level can choose a research stream in the fourth year. They should do a research project or dissertation under the guidance of a faculty member of the University/College. The research project/dissertation will be in the major discipline. The students, who secure 184 credits including 12 credits from a research project/dissertation, are awarded UG Degree (Honours with Research).

PROGRAM OUTCOMES OF UG PROGRAM OF FACULTY OF SCIENCES

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study
PO2	Research Aptitude	Capability to ask relevant/appropriate questions for identifying, formulating and analyzing the research problems and to draw conclusion from the analysis
PO3	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large
PO4	Problem Solving	Capability of applying knowledge to solve scientific and other problems
PO5	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings
PO6	Investigation of Problems	Ability of critical thinking, analytical reasoning and research-based knowledge including design of experiments, analysis and interpretation of data to provide conclusions
PO7	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices
PO8	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices
PO9	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout life
PO10	Ethics	Capability to identify and apply ethical issues related to one's work, avoid unethical behavior such as fabrication of data, committing plagiarism and unbiased truthful actions in all aspects of work
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects

PROGRAM SPECIFIC OUTCOMES (PSOs)

The program specific outcomes (PSO's) are the statement of competencies/abilities that describes the knowledge and capabilities the under-graduate will have by the end of program studies.

After successful completion of B.Sc. (Hons.) Mathematics& Computing, the students will be able to:

PSO1	Acquire an understanding and in-depth knowledge of core areas of mathematics like algebra, calculus, geometry, differential equations. This also leads to study of related areas like computer science and statistics. Thus, this program helps learners in building a solid foundation for higher studies in mathematics
PSO2	Learn to logically question assertions, to recognize patterns and to distinguish between essential and irrelevant aspects of problems. They also share ideas and insights while seeking and benefitting from knowledge and insight of others. This helps them to learn behave responsibly in a rapidly changing interdependent society. They will be capable to present mathematics clearly and precisely, make vague ideas precise by formulating them in the language of Mathematics, describe mathematical ideas from multiple perspectives and explain fundamental concepts of Mathematics to non-mathematicians.
PSO3	Attain abilities of critical thinking, problem mapping and solving using fundamental principles of Mathematics, systematic analysis and interpretation of results, and unambiguous oral and writing/presentation skills. This program has a strong foundation in basic and practical aspects of Mathematics enabling the students to venture into research in front-line areas of mathematical sciences, to pursue higher studies in Mathematics, and to enhance their employability for teaching jobs, government jobs, jobs in banking, insurance and investment sectors, data analyst jobs etc.

DEPARTMENT OF MATHEMATICS
SCHEME
B.Sc. MATHEMATICS& COMPUTING / B.Sc. (Hons. / Hons. with Research) MATHEMATICS& COMPUTING
<u>SEMESTER-I</u>

Subject Code	Title	L	P	Internal Assessment	End- semester Examination	Total	Credits	Category Code
Discipline Specific Course (DSC)								
BMH23-101	Calculus-I	3	0	25	75	100	3	DSC
BMH23-102	Calculus-I (Lab)	0	2	15	35	50	1	DSC
BMH23-103	Algebra	4	0	25	75	100	4	DSC
BCA-23-101	Fundamentals of Computers	4	0	25	75	100	4	DSC
Minor Course (MIC)								
BMH23-104	Probability and Statistics -I	4	0	25	75	100	4	MIC
Multidisciplinary Course (MDC) (Choose any one 3 Credit course)								
OPHY23-101	Electricity & Magnetism	2	0	25	75	100	2	MDC
OEC-CE-1011	Introduction to Programing	2	0	25	75	100	2	MDC
BCH-S-101	Chemistry I	2	0	25	75	100	2	MDC
OPHY23-102	Electricity & Magnetism (Lab)	0	2	15	35	50	1	MDC
OEC-CE-1012	Introduction to Programing (Lab)	0	2	15	35	50	1	MDC
BCH-S-102	Chemistry I(Lab)	0	2	15	35	50	1	MDC
Ability Enhancement Course (AEC)								
AEC-101-N1	Writing Skillsand Art of Rhetoric	2	0	25	75	100	2	AEC

Skill Enhancement Course (SEC) (Choose any one 3 credit course)								
SEC23-M-101	Calculation Skills with Vedic Mathematics	3	0	25	75	100	3	SEC
SEC23-M-102	Finance for Everyone	3	0	25	75	100	3	SEC
Value Added Course (VAC)								
VAC-101-N1	Environmental Studies-I	2	0	25	75	100	2	VAC
Total Credits							**26**	

SEMESTER - II

Subject Code	Title	L	P	Internal Assessment	End- semester Examination	Total	Credits	Category Code
Discipline SpecificCourse (DSC)								
BMH23-201	Calculus-II	3	0	25	75	100	3	DSC
BMH23-202	Calculus-II (Lab)	0	2	15	35	50	1	DSC
BMH23-203	Differential Equations	3	0	25	75	100	3	DSC
BMH23-204	Differential Equations (Lab)	0	2	15	35	50	1	DSC
BCA-23-109	Introduction to Operating System	3	0	25	75	100	3	DSC
BCA-23-115	Operating System Lab	0	2	30	70	100	1	DSC
Minor Course (MIC)								
BMH23-205	Probability and Statistics –II	4	0	25	75	100	4	MIC
MultidisciplinaryCourse (MDC) (Choose any one 3 Credit course)								
OPHY23-201	Mechanics	2	0	25	75	100	2	MDC
OEC-CE-1013	Introduction to Database System	2	0	25	75	100	2	MDC

BCH-S-201	Chemistry –II	2	0	25	75	100	2	MDC
OPHY23-202	Mechanics (Lab)	0	2	15	35	50	1	MDC
OEC-CE-1014	Introduction to Database System (Lab)	0	2	15	35	50	1	MDC
BCH-S-202	Chemistry II (Lab)	0	2	15	35	50	1	MDC
Ability Enhancement Course (AEC)								
AEC-102-N1	Communication, Mediation and Resolution	2	0	25	75	100	2	AEC
Skill Enhancement Course (SEC)								
OEC-CE-1015	Python	3	0	25	75	100	3	SEC
Value Added Course (VAC)								
VAC-103-N1	Yoga and Meditation	2	0	25	75	100	2	VAC
Total Credits							**26**	

Grand Total Credits: 52

NOTE: 1. Discipline Specific Course (DSC) papers may be added or deleted as per UGC guidelines.
2. Skill Enhancement Course (SEC) papers may be added or deleted as per UGC guidelines.

Grading Scheme

*Percentage	Grade	Grade Points	Category
90-100	O	10	Outstanding
80-90	A+	9	Excellent
70-80	A	8	Very Good
60-70	B+	7	Good
50-60	B	6	Above Average
45-50	C	5	Average
40-45	P	4	Pass
<40	F	0	Fail
......	Ab	0	Absent

** *Lower limit included, upper limit excluded**
The multiplication factor for CGPA is 10

1. Automatic Rounding
2. Average difference between actual percentage and CGPA percentage ± 2.5%
3. Worst case difference between actual percentage and CGPA percentage ± 5% if somebody in all the 8 semesters in all the exams (around 75 in numbers) consistently scores at the bottom of the range, say 55 of 55-65 which is a very remote possibility

**Syllabus
of
B.Sc. Mathematics& Computing**

Semester - I

Discipline Specific Course (DSC)
B.Sc. MATHEMATICS& COMPUTING
SEMESTER-I
CODE: BMH23-101
SUBJECT NAME: Calculus-I
NO. OF CREDITS: 3

Internal Assessment: 25

L   P   End Semester: 75
3   0   Total: 100

COURSE OUTCOMES
Students will be able to:
CO1:   Examine the continuity and differentiability of a function at a point.
CO2:   Perform successive differentiation of functions.
CO3:   Understand various mean value theorems for differentiable functions.
CO4:   Sketch curves in Cartesian and polar coordinate systems.

UNIT – I
Limit of a function, ε-δ definition of limit, Limit at infinity, Infinite limits, Continuity of a real valued function, Types of discontinuities, Properties of continuous functions, Geometrical interpretation of continuity,Indeterminate forms,L'Hôpital's rule.

UNIT – II
Differentiability of a real valued function, Geometrical interpretation of differentiability, Relation between differentiability and continuity, Chain rule of differentiation, Successive differentiation, Calculation of nth derivatives, Leibnitz's theorem.

UNIT - III
Darboux's theorem, Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Geometrical interpretation of mean value theorems, Taylor's theorem, Maclaurin's and Taylor's series expansions.

UNIT - IV
Asymptotes, Asymptotes parallel to axes, Concavity, Points of inflection, First and second derivative test for relative extrema, Singular points, Tangents at origin, Tracing of curves, Parametric representation of curves,Tracing of parametric curves, Polar coordinates, Tracing of curves in polar coordinates.

TEXT BOOKS
1.   Howard Anton, I. Bivens and Stephan Davis, *Calculus*, 10th edition, Wiley India, 2016.
2.   Tom M. Apostol, *Calculus*, Vol 1, An Indian Adaptation, 2nd edition, Wiley India, 2023.
3.   George B. Thomas Jr., Joel Hass, Christopher Heil and Maurice D. Weir, *Thomas' Calculus*, 14th edition, Pearson Education, 2018.

REFERENCE BOOKS
1.   Monty J. Strauss, Gerald L. Bradley and Karl J. Smith, *Calculus,* 3rd edition, Dorling

Kindersley (India)   Pvt. Ltd. (Pearson Education), Delhi, 2007.
2.   George B. Thomas and R.L. Finney, *Calculus and AnalyticGeometry*, 9th edition, Pearson Education, Delhi, 2010.
3.   Gorakh Prasad, *Differential Calculus*, 19th edition, Pothishala Pvt. Ltd, 2016.

SUGGESTED WEB SOURCES:
1.   https://nptel.ac.in/
2.   https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course Calculus-I

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	1	2	2	3	2	2	3	3
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	3
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.75	2.5	2.75	2.75	2.75

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Discipline Specific Course (DSC)
B.Sc. (H) MATHEMATICS&COMPUTING
SEMESTER-I
CODE: BMH23-102
SUBJECT NAME: Calculus-I (Lab)
NO. OF CREDITS: 1

	Internal Assessment: 15
L P	End Semester: 35
0 2	Total: 50

COURSE OUTCOMES
Students will be able to:
CO1: Write a computer program for plotting the graph of different functions.
CO2: Write a computer program for the limit and differentiation of various functions.
CO3: Write a computer program for sketching parametric curves.
CO3: Write a computer program for performing various matrix operations.

Practical/Lab work to be performed on a computer:
Modeling of the following problems using Matlab/Mathematica etc.

1. Basic matrix operations such as addition, multiplication, inverse, transpose, determinant, submatrix, compatibility, element wise multiplication etc.
2. Plotting the graphs of functions,
    $cx, [x], |ax + b|, sin\ (ax + b), cos\ (ax + b)$ $,|sin\ (ax + b)|,\ |cos\ (ax + b)|, e^{ax+b}$, $log\ (ax + b)$ and to illustrate the effects of a and b on the graphs.
3. Plotting the graphs of polynomials of degree 4 and 5, their first and   second derivatives and analysis of these graphs.
4. Computation of limit and differentiation of functions.
5. Taylor series expansion of functions.
6. Sketching of curves along with their asymptotes.
7. Sketching of parametric curves.

CO-PO and CO-PSO matrix for the course Calculus-I (Lab)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	1	2	2	3	2	2	1	2
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	2
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.75	2.5	2.8	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Discipline Specific Course (DSC)
B.Sc. (H) MATHEMATICS& COMPUTING
SEMESTER-I
CODE: BMH23-103
SUBJECT NAME: Algebra
NO. OF CREDITS: 4

Internal Assessment: 25

L	P
4	0

End Semester: 75
Total: 100

COURSE OUTCOMES:
 This course will enable the students to :
CO1:   Explore different types of matrices
CO2:   Have knowledge of system of Linear Equations, Echelon form
CO3:   Know importance of rank of a Matrix, EigenValues and EigenVectors
CO4:   Find roots of cubic polynomials

UNIT – I
Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary Operationson matrix. Rank of a matrix. Inverseof a matrix.Linear dependence and independence of rows and columns of a matrix. Row rank and column rank of a matrix. Eigenvalues, eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix.

UNIT – II
Cayley - Hamilton theorem and its use in finding the inverse of a matrix,Applications of matrices to a system of linear (homogeneous and non–homogeneous) equations. Theorems on consistency of a system of linear equations.Unitary and Orthogonal Matrices.Diagonalisation of Matrices.Quadratic form.

UNIT –III
Relations between the roots and coefficients of a general polynomial equation in one variable.Solutions of polynomial equations having conditions on roots.Common roots and multiple roots. Transformation of equations

UNIT-IV
Nature of the roots of an equation, Descartes's rule of signs, Solution of cubic and biquadratic equations

TEXT BOOKS
1. Andreescu, Titu&AndricaDorin. (2014). Complex Numbers from A to...Z.   (2nd ed.). Birkhäuser.
2. David C. Lay, *Linear Algebra and its Applications*, 3rd Edition, Pearson Education Asia, Indian Reprint, 2007.
3. Seymour Lipschutz and Marc L. Lipson, *Schaum's outline of Linear Algebra*, 4th Edition, McGraw Hill, 2009.

REFERENCE BOOKS

1. Kolman, Bernard, & Hill, David R. (2001). Introductory Linear Algebra with Applications (7th ed.). Pearson Education, Delhi. First Indian Reprint 2003.
2. Dickson, Leonard Eugene (1922). First Course in The Theory of Equations. John Wiley & Sons, Inc. New York. The Project Gutenberg EBook.
3. Goodaire, Edgar G., &Parmenter, Michael M. (2005). Discrete Mathematics with Graph Theory (3rd ed.). Pearson Education Pvt. Ltd. Indian Reprint 2015.
4. Sudesh K. Shah and Subhash C. Garg, *A Textbook of Algebra*, 1st Edition, Vikas Publishing House Pvt. Ltd., 2017.

SUGGESTED WEB SOURCES:
1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course Algebra

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	2	2	2	3	2	2	3	3
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	3
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.75	2.5	2.5	2.75	2.5	2.75	2.75	2.75

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Discipline Specific Course (DSC)
B.Sc. (H) MATHEMATICS& COMPUTING
SEMESTER-I
CODE: BMH23-103
SUBJECT NAME: Fundamentals of ComputersNO. OF CREDITS: 4

		Internal Assessment:	25
L	P	End Semester:	75
4	0	Total:	100

Course Objectives:
CO1: To understand the major components of computer system, the types and functions of memory.
CO2: To learn about the difference between software and hardware in a computer system along with the fundamentals of Operating systems and its types.
CO3: To understand the concept of programming languages and their corresponding Translators
CO4: To learn about the basic types of Networks, Internet and computer viruses.

UNIT – I: Computer Fundamentals
Generations of Computers, Definition, Block Diagram along with its components, characteristics & classification of computers, Limitations of Computers, Human-Being VS Computer, Applications of computers in various fields. Memory: Concept of primary & secondary memory, RAM, ROM, types of ROM, Cache Memory, flash memory, Secondary storage devices: Sequential & direct access devices viz. magnetic tape, magnetic disk, optical disks i.e. CD, DVD, virtual memory.

UNIT – II: Computer hardware & software
I/O devices, definition of software, relationship between hardware and software, types of software. Overview of operating system: Definition, functions of operating system, concept of multiprogramming, multitasking, multithreading, multiprocessing, time-sharing, real time, single-user& multi-user operating system.

UNIT – III: Computer Languages
Analogy with natural language, machine language, assembly language, high-level languages, fourth generation languages, compiler, interpreter, assembler, Linker, Loader, History and Characteristics of a good programming language, Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming, Advantages and disadvantages of Structured programming.

UNIT IV: Overview of Networking
An introduction to computer networking, Network types (LAN, WAN, MAN), Network topologies, Modes of data transmission, Forms of data transmission, Transmission channels(media),OSI model, Introduction to internet and its uses, Applications of internet, Hardware and Software requirements for internet, Intranet, Applications of intranet. Computer Virus: Definition, types of viruses, Characteristics of viruses, anti-virus software.

Text Books:
1. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books
Publishing Co., New Delhi.
2.Balagurusamy E, Computing Fundamentals and C Programming, Tata McGraw Hill.
3. Norton, Peter, Introduction to Computer, McGraw-Hill

Reference Books:
1. Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World
2.Rajaraman, V., Fundamentals of Computers, PHI

SUGGESTED WEB SOURCES:
1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course Fundamental of Computers

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	2	2	2	3	2	2	3	3
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	3
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.75	2.5	2.5	2.75	2.5	2.75	2.75	2.75

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Minor Course (MIC)
B.Sc.MATHEMATICS& COMPUTING
SEMESTER-I
CODE: BMH23-104
SUBJECT NAME: Probability and Statistics-I
NO. OF CREDITS: 4

		Internal Assessment:	25
L	P	End Semester:	75
4	0	Total:	100

COURSE OUTCOMES
This course will enable the students to:
CO1: Learn basic Probability basic Statistics
CO2:Learn basic Statistics
CO3: Formulate and analyze mathematical and statistical problems based on centraltendency
CO4: Establish a formulation helping to predict one variable in terms of the other that is, correlation and linear regression

UNIT-I
Probability Theory: Introduction, Fundamental concepts of probability, Laws of probability, Conditional probability, Bayes theorem.

UNIT-II
Introduction to Statistics: Definition, Types of Data, Applications of Statistics in Business and Economics, Continuous frequency distribution, Graphic presentation of data, Measure of central tendency (Mean, Median, Mode).

UNIT-III
Measure of Dispersion: Absolute and Relative measure of dispersion, Range, Standard deviation, Measure of Skewness, Kurtosis.

UNIT-IV
Correlation Analysis: Introduction, Types of correlation, Correlation coefficient, Rank correlation.
Regression Analysis: Introduction, Regression lines, method of least square, Regressioncoefficient

TEXT BOOKS
1. Irwin Miller and Marylees Miller, John E. Freund"s Mathematical Statistics with Applications (8th edition). Pearson. Dorling Kindersley Pvt. Ltd. India,2014.
2. Gupta S.C. and Kapoor V.K., Fundamentals ofMathematical Statistics, S.   Chand Pub., New Delhi.,1970.

REFERENCE BOOKS

1. Robert V. Hogg, Joseph W. McKean & Allen T. Craig ,Introduction to   Mathematical Statistics ,7th edition, Pearson Education, 2013.
2. Jim Pitman, Probability, Springer-Verlag, 1993.
3. Sheldon M. Ross, Introduction to Probability Models ,11th edition, Elsevier, 1993.
4. A. M. Yaglom and I. M. Yaglom, Probability and Information. D. Reidel Publishing Company. Distributed by Hindustan Publishing Corporation (India) Delhi, 1993.

SUGGESTED WEB SOURCES:

    1.   https://nptel.ac.in/

2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course Probability and Statistics -I

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	2	2	2	3	2	2	3	3
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	3
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.75	2.5	2.5	2.75	2.5	2.75	2.75	2.75

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Multidisciplinary Course (MDC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER-I
CODE: OPHY23-101
ELECTRICITY AND MAGNETISM

		Internal Assessment:	25
L	P	End Semester:	75
2	0	Total:	100

Course Outcomes:
After the completion of the course, students will be able to:
1. Know the basic concepts of electric field and potential
2. Understand of dielectric behavior of matter
3. Learn the laws of magnetism and electromagnetic induction.
4. Have an understanding of electromagnetic wave propagation.

UNIT-I

Vector Analysis: Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields (statements only), Gauss-divergence theorem and Stoke's theorem of vectors (statement only)

UNIT-II

Electrostatics: Electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

UNIT-III

Magnetism: Magnetostatics: Biot-Savart's law. Divergence and curl of magnetic field. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro- magnetic materials.

UNIT-IV

Electrodynamics: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field. Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves.

TEXT BOOKS

1. Edward M. Purcell, Electricity and Magnetism, 1986, McGraw-Hill Education
2. , J.H. Fewkes&J.Yarwood, Electricity & Magnetism. Vol. I, 1991, Oxford Univ.Press

REFERENCE BOOKS

1. D C Tayal, Electricity and Magnetism, 1988, Himalaya Publishing House.
2. Ronald Lane Reese, University Physics, 2003, Thomson Brooks/Cole.
3. D.J.Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.

SUGGESTED WEB SOURCES:
   1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course Electricity and Magnetism

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	2	2	2	3	2	2	3	3
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	3
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.75	2.5	2.5	2.75	2.5	2.75	2.75	2.75

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Multidisciplinary Course (MDC)
B.Sc.MATHEMATICS & COMPUTING
SEMESTER-I
CODE: OEC-CE-1011
SUBJECT NAME: Fundamentals of Programming
NO. OF CREDITS: 02

	Internal Assessment:	25
L P	End Semester:	75
2 0	Total:	100

COURSE OUTCOMES

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

CO1: Differentiate between Procedure-Oriented programming and Object-Oriented programming

CO2: Have understanding the syntax of the language

CO3: Implement various object oriented features like inheritance, data abstraction encapsulation and
        polymorphism to solve various computing problems using C++ language

CO4: Apply object oriented concepts in real world programs

UNIT-I

Introduction to C and C++ : History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C++. Data Types, Variables, Constants, Operators and Basic I/O: Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise).

UNIT-II

Expressions, Conditional Statements and Iterative Statements: Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative).

UNIT-III

Functions and Arrays: Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions. Creating and Using One Dimensional Arrays (Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Use various types of arrays (integer, float and character arrays / Strings) Two- dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns).

UNIT-IV

Using Classes in C++: Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors, Constructor Overloading, Function overloading in classes, Class Variables &Functions,

Specifying the Protected and Private Access, Copy Constructors,. Inheritance and Polymorphism: Introduction to Inheritance and Polymorphism.

TEXT BOOKS
1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
2. Sharma A. K., "Computer Fundamentals and Programming in C ", 2018
3. HerbtzSchildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill, 2017.

REFERENCE BOOKS

1. KanetkarYashavant P. ,"Let us C", BPB Publications, 2010.
2. E. Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education, 2008.
3. Paul Deitel, Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.

SUGGESTED WEB SOURCES:
1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course Fundamentals of Programming

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	2	2	2	3	2	2	3	3
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	3
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.75	2.5	2.5	2.75	2.5	2.75	2.75	2.75

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Multidisciplinary Course (MDC)
B.Sc.MATHEMATICS & COMPUTING
SEMESTER-I
CODE: BCH-S-101
SUBJECT NAME: ChemistryI
NO OF CREDITS: 2

L P	Internal Assessment: 25
2 0	End Semester: 75
	Total: 100

COURSE OUTCOMES:
After the successful completion of the course, the learner would be able to
CO1 : Have understanding the basic concept of atomic structure
CO2: Explore the chemical bonding concept
CO3 :Explain the role of inorganic chemistry in biological systems
 CO4: basic concept of Bio-Inorganic Chemistry

UNIT-I

Atomic Structure and Chemical bonding: Review of Bohr''s theory and its limitations,
Heisenberg Uncertainty p rinciple. Dual behavior of matter and radiation, de-Broglie''s
relation.Hydrogen atom spectra.Significance of ψ and $\psi 2$, Schrödinger equation for hydrogen
atom.
Ionic Bonding*:* General characteristics of ionic bonding. Energy considerations in
ionic bonding, lattice energy and solvation energy and their importance in the
context of stability and solubility of ionic compounds.

Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of
VSEPR (H_2O, NH_3, PCl_5, SF_6, ClF_3) and hybridization with suitable examples of linear, trigonal
planar, square planar, tetrahedral, trigonalbipyramidal and octahedral arrangements.

MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their
characteristics for *s-s*, *s-p* and *p-p* combinations of atomic orbitals, nonbonding combination of
orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods and
heteronuclear diatomic molecules such as CO, NO .

UNIT-II   Bio-Inorganic Chemistry:
A brief introduction to bio-inorganic chemistry. Role of metal ions present in biological systems
with special reference to Na^+, K^+ and Mg^{+2} ions: Na/K pump; Role of Mg^{+2} ions in energy
production and chlorophyll.

TEXT BOOKS

1. J. D. Lee: A new Concise Inorganic Chemistry, E L. B. S.17, 2008.
2. F. A. Cotton & G. Wilkinson: *Basic Inorganic Chemistry*, John Wiley, 3rd Ed., 1995.

REFERENCE BOOKS

1. Douglas, McDaniel and Alexader: *Concepts and Models in Inorganic Chemistry*, John Wiley, 3rd Ed. 1994.
2. James E. Huheey, Ellen Keiter and Richard Keiter: *Inorganic Chemistry:* Principles of *Structure and Reactivity*, Pearson Publication, 1997.

SUGGESTED WEB SOURCES:
    1.   https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course Chemistry - 1

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	2	2	2	3	2	2	3	3
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	3
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.75	2.5	2.5	2.75	2.5	2.75	2.75	2.75

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Multidisciplinary Course (MDC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER-I
CODE: OPHY23-102
ELECTRICITY AND MAGNETISM LAB
Credits: 01

L **P**	Internal Assessment: 15
0 2	End Semester: 35
	Total: 50

At least 05 experiments from the following:

1. To compare capacitances using De'Sauty's bridge.

2. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx)

3. To study the Characteristics of a Series RC Circuit.

4. To study a series LCR circuit LCR circuit and determine its

   (a) Resonant frequency, (b) Quality factor

5. To study a parallel LCR circuit and determine its

   (a) Anti-resonant frequency and(b) Quality factor Q

6. To determine a Low Resistance by Carey Foster's Bridge.

7. To find the inductance of a coil using Anderson's brodge.

Reference Books

1.Advanced Practical Physics for students, B.L.Flint&H.T.Worsnop, 1971, Asia
   Publishing House.
2.Engineering Practical Physics, S. Panigrahi and B.Mallick, 2015, Cengage Learning
   India Pvt. Ltd.
3.A Text Book of Practical Physics, I.Prakash&Ramakrishna, 11th Ed.2011, KitabMahal

CO-PO and CO-PSO matrix for the course Electricity and Magnetism Lab

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	1	2	2	3	2	2	1	2
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	2
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.75	2.5	2.8	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Multidisciplinary Course (MDC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER-I
CODE: OEC-CE-1012
SUBJECT NAME: Fundamentals of Programming (Lab)
NO OF CREDITS: 1

		Internal Assessment:	15

L   P   Internal Assessment: 15
0   2   End Semester: 35
                                                     Total: 50

Introduction to Programming Lab

1. Write a program to print "HELLO"
2. Write a program to add two numbers.
3. Write a program to calculate simple interest.
4. Write a program to calculate absolute value of a number.
 5. Write a program to swap the values of two numbers.
6. Write a program to find gross salary of a person.
 7. Write a program to check if a number is even or odd.
 8. Write a program to find greatest of three numbers.
 9. Write a program to find grade of a student given his marks.
10. Write a program to find divisor or factorial of a given number.
11. Write a program to print the Fibonacci series.
12. Write a program to print first ten natural numbers.
13. Write a program to print the reverse of a number.
14. Write a program to print the multiplication table of a given number.
15. Write a program to find grade of a list of students given their marks.
16. Write a program using function power (a, b) to calculate the value of a raised to b.
17. Write a program to print a 1-D array of 10 numbers in reverse order.

CO-PO and CO-PSO matrix for the course Fundamentals of Programming Lab

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	1	2	2	3	2	2	1	2
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	2
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.75	2.5	2.8	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Multidisciplinary Course (MDC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER-I
CODE:BCH-S-102
SUBJECT NAME: Chemistry I (Lab)
NO. OF CREDITS: 1

		SESSIONAL	: 15
L	P	FINAL EXAM	: 35
0	1	TOTAL	: 50

The students have to perform at least 4 experiments from the following

1. Preparations: (Any two)
Preparation of Cuprous chloride, tetra ammine cupric sulphate, chrome alum, potassium trioxalatochromate(III), Nickel Dimethylglyoxime

2. Volumetric Analysis
- Preparation of reference solutions.
- Redox titrations: Determination of Fe^{2+}, $C_2O_4^{2-}$ (using $KMnO_4$, $K_2Cr_2O_7$)
- Complexometric titrations: Determination of Mg^{2+}, Zn^{2+} by EDTA.

REFERENCE BOOKS

1. J. D. Lee: *A new Concise Inorganic Chemistry*, E L. B. S.17
2. F. A. Cotton & G. Wilkinson: *Basic Inorganic Chemistry*, John Wiley.

3. Douglas, McDaniel and Alexader: *Concepts and Models in Inorganic Chemistry*, John Wiley.

4. James E. Huheey, *Ellen Keiter and Richard Keiter: Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Publication.

CO-PO and CO-PSO matrix for the course Chemistry Lab - 1

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	1	2	2	3	2	2	1	2
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	2
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.75	2.5	2.8	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Ability Enhancement Course (AECC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER- I
CODE: AEC-101-N1
SUBJECT NAME:Writing Skills and the Art of Rhetoric (WSAAR)
NO. OF CREDITS: 02

		Internal Assessment	25
L	P	End Semester:	75
2	0	Total:	100

Course Outcomes:
CO1: Students will demonstrate great interpersonal communication skills.
CO2: Students will adopt the habit of rational thinking and reflection.
CO3: Students will adopt cognitive skills for better problem-solving.
CO4: Students will practise communication for mediation and conflict-resolution.

Unit-I: Communication and Barriers to Communication: 7C's of Communication, Win-Win Communication, Strategies for Effective Communication, Zero-Sum; Reasons for Conflict; Communication Barriers.

Unit-II: Critical Thinking and Cognitive Skills: reason;analysis, synthesis, divide and rule; root-cause analysis; logic and logical fallacies.
Reasoning; Logic; Inductive and Deductive Reasoning; Logical fallacies: *Ad hominem,* straw man fallacy; bandwagon fallacy; hasty generalization; false dilemma; false dichotomy;*TuQuoque*; circular reasoning and hasty generalization; Recognizing fallacies.

Unit-III: Mediation and Conflict-Resolution: Cognitive Skills and Critical thinking; Listening for key words, phrases and hints, Creative Communicating, Managing and celebrating Diversity, Adaptability and Negotiation; Dispute-resolution; arbitration; mediator's role; caucuses, third party, objectivity, impartiality, neutrality, offers, counter offers, questions, demands, and proposals, impasse, settlement.Brainstorming, Problem solving strategies, Stress management, Significance of Collaboration, Confronting challenges.

Unit-IV: Mediation in Practice: Exercises in role-playing and mediation and one case study assignment as directed by the teacher.

TEXT BOOKS
1. KaulAsha, The Effective Presentation, Response Books, New Delhi.
2. SanghiSeema, Towards Personal Excellence, Response Books, New Delhi.

REFERENCE BOOKS

1. Robbins Stephen and SanghiSeema, Organizational Behaviour. Pearson. Latest Edition.
2. Bretag, Crossman and Bordia. Communication Skills. Tata McGraw-Hill.

SUGGESTED WEB SOURCES:

1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course Writing Skills and the Art of Rhetoric (WSAAR)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	2	2	2	3	2	2	3	3
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	3
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.75	2.5	2.5	2.75	2.5	2.75	2.75	2.75

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Skill Enhancement Course (SEC)
B.Sc.MATHEMATICS & COMPUTING
SEMESTER- I
CODE: SEC23-M-101
SUBJECT NAME: Calculation Skills with Vedic Mathematics
NO OF CREDITS: 3

		Internal Assessment:	25
L	P	End Semester:	75
3	0	Total:	100

COURSE OUTCOMES:
Students will be able to
CO1: Learn about the history of Vedic Mathematics, Sutras and Upsutras from Vedic Mathematics.
CO2: Perform arithmetic calculations with speed and accuracy.
CO3: Use Vedic sutras to find LCM and HCF of numbers.
CO4: Calculate squares of numbers speedily with accuracy..

UNIT-I
History of Vedic Mathematics, Introduction to Sutras and Upsutras, Addition in Vedic Mathematics without carrying, Dot method, Subtraction in Vedic Mathematics, NikhilamNavatashcaramamDashatah (All from 9 last from 10), Fraction-Addition and subtraction.

UNIT-II
Multiplication of two numbers of two digits, Multiplication of two numbers of three digits Multiplication by UrdhvaTiryak sutra.

UNIT-III
Division: two digit divisor, ParavartyaYojyet method (three digit divisor), Division by UrdhvaTiryak Sutra (Vinculum method), LCM, HCF.

UNIT-IV
Square of two digit numbers: Base method, squares of numbers ending in 5: EkadhikenaPurvena Sutra, Square roots: Dwandwa Yoga (duplex) Sutra.

TEXT BOOKS
1. Rajesh K. Thakur, The Essential of Vedic Mathematics, Rupa Publications, New Delhi, 2019.
2. S.B.K. Krishna Trithaji, *Vedic Mathematics,* MotilalBanarasidas, New Delhi, 1990

REFERENCE BOOKS
1. Chaitanya A. Patil, Learn Vedic Speed Mathematics Systematically, 2018/

SUGGESTED WEB SOURCES:

1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course Calculation Skills with Vedic Mathematics

Cos	PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	3	3	2	2	3	2	3	3	3	3
CO2	3	3	3	3	3	3	3	2	3	2	2	3	3	3
CO3	3	3	3	3	3	3	3	2	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	3	3	3	3	3	3
Average	3	3	3	3	3	3	2.75	2	3	2.5	2.75	3	3	3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Skill Enhancement Course (SEC)
B.Sc.MATHEMATICS & COMPUTING
SEMESTER- I
CODE: SEC23-M-102
SUBJECT NAME: Finance for Everyone
NO OF CREDITS: 3

		Internal Assessment:	25
L	P	End Semester:	75
3	0	Total:	100

COURSE OUTCOMES:
Students will be able to
CO1: Learn about the importance of financial literacy.
CO2: Prepare a financial plan, budget and manage personal finances.
CO3: Learn about the tax structure.
CO4: Plan for life insurance and property insurance.

UNIT-I
Financial goals, steps in financial planning, budgeting incomes and payments, time value of money, Introduction to savings, benefits of savings, management of spending & financial discipline, Setting alerts and maintaining sufficient funds for fixed commitments

UNIT-II
Process and objectives of investment, concept and measurement of return & risk for various asset classes, measurement of portfolio risk and return, diversification & portfolio formation, Gold bond; Real estate; Investment in greenfield and brownfield Projects; Investment in fixed income instruments, financial derivatives & commodity market in India. Mutual fund schemes; International investment avenues, Currency derivatives and digital currency

UNIT-III
Tax structure in Índia for personal taxation,Scope of personal tax planning, exeinptions and deductions available to individuals under different heads of incoine and gross total incolne, Comparison of benefits - Special provision u/s 115 BAC vis-à-vis General provisions of the Incolue-tax Act, 1961, tax avoidance versus tax evasion

UNIT-IV
Need for insurance. Life insurance, health insurance, property insurance, credit life insurance and professional liability insurance

TEXT BOOKS

1. Halan, M. "Let's Talk Money: You've Worked Hard for It, Now Make It Work for You" Harper Collins Publishers, New York.
2. Indian Institute of Banking & Finance. "Introduction to Financial Planning" Taxmann Publication, New Delhi.

REFERENCE BOOKS
1. Keown A.J. "Personal Finance" Pearson, New York.
2. Madura, J. "Personal Finance", Pearson
3. Pandit, A. "The Only Financial Planning Book that You Will Ever Need" Network 18 Publications Ltd., Mumbai.
4. Sinha, M. "Financial Planning: A Ready Reckoner" McGraw Hill Education, New York

SUGGESTED WEB SOURCES:
1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course finance for everyone

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	2	3	2	3	3	3	3
CO2	3	3	3	3	3	3	3	2	3	2	2	3	3	3
CO3	3	3	3	3	3	3	3	2	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	3	3	3	3	3	3
Average	3	3	3	3	3	3	2.75	2	3	2.5	2.75	3	3	3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Value Added Course (VAC)
B.Sc.MATHEMATICS & COMPUTING
SEMESTER- I
CODE: VAC-101-N1
SUBJECT NAME: Environmental Studies I
NO OF CREDITS: 2

                                                    Internal Assessment: 25
L   P   End Semester: 75
2   0   Total: 100

COURSE OUTCOMES:
At the completion of this course, the learner will be able to:
CO1:   Understand human interaction with the environment and efforts taken at international level to protect and conserve environment.
CO2:   Understand concept of natural resources, their distribution, conservation, management and sustainable utilization.
CO3:   Develop critical thinking towards local, regional and global environmental issue.
CO4:   Describe the concept of ecosystem, biodiversity and their conservation.

Unit I: Humans and the Environment
The man-environment interaction: Humans as hunter-gatherers; Mastery of fire; Origin of agriculture; Emergence of city-states; Great ancient civilizations and the environment, Indic Knowledge and Culture of sustainability; Middle Ages and Renaissance; Industrial revolution and its impact on the environment; Population growth and natural resource exploitation; Global environmental change. *Environmental Ethics and emergence of environmentalism:* Anthropocentric and eco-centric perspectives (Major thinkers); The Club of Rome- Limits to Growth; UN Conference on Human Environment 1972; World Commission on Environment and Development and the concept of sustainable development; Rio Summit and subsequent international efforts.

Unit II: Natural Resources and Sustainable Development
Overview of natural resources: Definition of resource; Classification of natural resources- biotic and abiotic, renewable and non-renewable.
Biotic resources: Major type of biotic resources- forests, grasslands, wetlands, wildlife and aquatic (freshwater and marine); Microbes as a resource; Status and challenges.
Water resources: Types of water resources- fresh water and marine resources; Availability and use of waterresources; Environmental impact of over-exploitation, issues and challenges; Water scarcity and stress;Conflicts over water.
Soil and mineral resources: Important minerals; Mineral exploitation; Environmental problems due to extraction of minerals and use; Soil as a resource and its degradation.
Energy resources: Sources of energy and their classification, renewable and non-renewable sources of energy; Conventional energy sources- coal, oil, natural gas, nuclear energy; non-conventional energy sources- solar, wind, tidal, hydro, wave, ocean thermal, geothermal, biomass, hydrogen and fuel cells; Implications of energy use on the environment.
Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators,challenges and strategies for SDGs.

Unit III: Environmental Issues: Local, Regional and Global
Environmental issues and scales: Concepts of micro-, meso-, synoptic and planetary scales; Temporal andspatial extents of local, regional, and global phenomena.
Pollution: Impact of sectoral processes on Environment; Types of Pollution- air, noise, water, soil, thermal,radioactive; municipal solid waste, hazardous waste; transboundary air pollution; acid rain; smog.
Land use and Land cover change: land degradation, deforestation, desertification, urbanization.

Biodiversity loss: past and current trends, impact.
Global change: Ozone layer depletion; Climate change. Disasters – Natural and Man-made (Anthropogenic)

Unit IV: Conservation of Biodiversity and Ecosystems

Biodiversity and its distribution: Biodiversity as a natural resource; Levels and types of biodiversity;Biodiversity in India and the world; Biodiversity hotspots; Species and ecosystem threat categories.*Ecosystems and ecosystem services:* Major ecosystem types in India and their basic characteristics-forests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services-classification andtheirsignificance.

Threats to biodiversity and ecosystems: Land use and land cover change; Commercial exploitation ofspecies; Invasive species; Fire, disasters and climate change.Major conservation policies: in-situ and ex-situ conservation approaches; Major protected areas;National and International Instruments for biodiversity conservation; the role of traditional knowledge, community-based conservation; Gender and conservation.

Field Work

The students are expected to be engaged in some of the following or similar identified activities:
  a) Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report.
  b) Discussion on one national and one international case study related to the environmentand sustainable development.
  c) Participationinplantationdriveandnaturecamps.
  d) Documentation ofcampus flora and fauna.

TEXT BOOKS

  1. Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Management for a Sustainable Future.10th edition, Upper Saddle River, N. J. Benjamin/Cummins/Pearson.
  2. Gilbert M. Masters and W. P. (2008). An Introduction to Environmental Engineering andScience, Ela Publisher (Pearson)

REFERENCE BOOKS

  1. Kaushik, A., &Kaushik, C. P. (2006). Perspectives in environmental studies. New Age International.
  2. Sharma, P. D., & Sharma, P. D. (2012). Ecology and environment. Rastogi Publications.
  3. William P. Cunningham and Mary A. (2015). Cunningham Environmental Science: A globalconcern, Publisher (Mc-Graw Hill, USA)

SUGGESTED WEB SOURCES:
  1. https://nptel.ac.in/
  2. https://swayam.gov.in/

CO-PO and CO-PSO matrix for the course finance for everyone

Cos	PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	3	3	2	2	3	2	3	3	3	3
CO2	3	3	3	3	3	3	3	2	3	2	2	3	3	3
CO3	3	3	3	3	3	3	3	2	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	3	3	3	3	3	3
Average	3	3	3	3	3	3	2.75	2	3	2.5	2.75	3	3	3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Syllabus
Of
B.Sc. Mathematics& Computing

Semester II

Discipline Specific Course (DSC)
B.Sc.MATHEMATICS & COMPUTING
SEMESTER-II
CODE: BMH23-201
SUBJECT NAME: Calculus-II
NO. OF CREDITS: 3

Internal Assessment: 25
L   P   End Semester: 75
3   0   Total: 100

COURSE OUTCOMES:
Students will be able to
CO1: Obtain reduction formulae of various functions.
CO2: Learn techniques of sketching conics.
CO3: Visualize three dimensional figures and calculate their volumes and surface areas.
CO4: Understand limit, continuity and differentiation of vector-valued functions.

UNIT – I
Indefinite integration, Definite integration, Fundamental theorem of Calculus, Exponential and logarithmic functions, Derivatives and integrals involving logarithmic and exponential functions, Inverse trigonometric functions, Hyperbolic functions, Reduction formulae.

UNIT – II
Techniques of sketching conics, Reflection properties of conics, Rotation of axes and second degree equations, Classification into conics using the determinant, Polar equations of conics.

UNIT - III
Volume by slicing, disks and washer methods, volumes by cylindrical shells, parametric equations, parameterizing a curve, arc length, arc length of parametric curves, area of surface of revolution, curvature.

UNIT - IV
Introduction to vector-valued functions and their graphs, Operations with vector functions, Limit, continuity, differentiation and integration of vector functions, Planetary motion, Kepler's second law, Unit tangent, Normal and binomial vectors.

TEXT BOOKS
1. Howard Anton, I. Bivens and Stephan Davis, *Calculus*, 10th edition, Wiley India, 2016.
2. Monty J. Strauss, Gerald L. Bradley and Karl J. Smith, *Calculus,* 3rd edition, Dorling Kindersley (India)   Pvt. Ltd. (Pearson Education), Delhi, 2007.
3. Tom M. Apostol, *Calculus*, Vol 1, An Indian Adaptation, 2nd edition, Wiley India, 2023.

REFERENCE BOOKS

1. George B. Thomas Jr., Joel Hass, Christopher Heil and Maurice D. Weir, *Thomas' Calculus*, 14th edition, Pearson Education, 2018.
2. George B. Thomas and R.L. Finney, *Calculus*, 9th edition, Pearson Education, Delhi, 2005.
3. Gorakh Prasad, *Differential Calculus*, 19th edition, Pothishala Pvt. Ltd, 2016.

SUGGESTED WEB SOURCES:

1. https://nptel.ac.in/

2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course Calculus-II

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	3	2	2	3	2	3
CO2	3	3	2	3	2	2	2	3	2	2	2	3	3	2
CO3	3	3	3	3	2	2	2	3	2	3	2	3	3	2
CO4	3	3	2	3	3	3	2	3	3	3	2	3	3	2
Average	3	3	2.5	3	2.5	2.5	2	3	2.5	2.5	2	3	2.75	2.25

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Discipline Specific Course (DSC)
B.Sc. (H) MATHEMATICS & COMPUTING
SEMESTER-II
CODE: BMH23-202
SUBJECT NAME: Calculus-II (Lab)
NO. OF CREDITS: 1

		Internal Assessment:	15
L	P	End Semester:	35
0	2	Total:	50

COURSE OUTCOMES:
Students will be able to
CO1: Write a computer program for sketching graphs of functions involving trigonometric and inverse trigonometric functions..
CO2: Write a computer program for sketching hyperbolic functions.
CO3: Write a computer program for tracing conics.
CO4: Write a computer program for finding the area of the surface of revolution.

Practical/Lab work to be performed on a computer:

Modeling of the following problems using Matlab/Mathematica etc.

1. Plotting the graphs of trigonometric and inverse trigonometric functions, the derivative graph and comparing them.
2. Graph of hyperbolic functions.
3. Integration of functions.
4. Tracing of conics in Cartesian coordinates.
5. Arc lengths of curves.
6. Obtaining the surface of the revolution of curves.

CO-PO and CO-PSO matrix for the course Calculus-II (Lab)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	3	2	3	2	2	3	3	3
CO2	3	3	2	3	2	3	3	2	3	2	2	3	1	2
CO3	3	3	2	3	2	3	3	2	3	2	2	3	2	2
CO4	3	3	2	3	2	3	3	2	3	2	3	3	3	2
Average	3	3	2	3	2	3	3	2	3	2	2.25	3	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Discipline Specific Course (DSC)
B.Sc. (H) MATHEMATICS & COMPUTING
SEMESTER-II
CODE: BMH23-203
SUBJECT NAME: Differential Equations
NO. OF CREDITS: 3

Internal Assessment: 25
L   P   End Semester: 75
3   0   Total: 100

COURSE OUTCOMES:

The course will enable the students to
  CO1: Learn the basics of ordinary differential equations.
  CO2: Learn various techniques to solve first order differential equations.
  CO3: Solve linear differential equations of an arbitrary order using various techniques.
  CO4: Apply various techniques to solve and analyze various mathematical models.

Unit-I
Basic concepts of ordinary differential equations, Order and degree of a differential equation, General solution of first order ordinary differential equation, Separable equations, Homogeneous equations, Bernoulli's equation, Linear differential equations and equations reducible to linear form, Exact differential equations, Integrating factor, Initial value problems.

Unit-II
Clairaut's form and singular solution, Picard's method of successive approximations and the statement of Picard's theorem for the existence and uniqueness of the solutions of the first order differential equations, equations solvable for x, y and p.

Unit-III
Principle of superposition for a homogeneous linear differential equation, Linearly dependent and linearly independent solutions on an interval, Wronskian and its properties, General solution of second order homogeneous differential equation with constant coefficients, Method of undetermined coefficients, Method of variation of parameters, Linear homogeneous and non-homogeneous equations of higher order with constant coefficients, Euler-Cauchy equation.

Unit-IV
Orthogonal trajectories, Compartmental models, Exponential growth and decay models, Radioactive decay, Lake pollution model, Drug assimilation into the blood of a single cold pill, Limited growth of population, Limited growth with harvesting, Equilibrium points and stability.

TEXT BOOKS
  1. Shepley L. Ross, *Differential Equations*, 3rd edition, Wiley India, 2014.
  2. Belinda Barnes and Glenn R. Fulford, *Mathematical Modeling with Case Studies: A Differential Equation Approach Using Maple and MATLAB*, 3rd edition, CRC Press, Taylor & Francis, 2015.

REFERENCE BOOKS
1. C. Henry Edwards, David E. Penny and David T. Calvis, *Differential Equations and Boundary Value Problems: Computing and Modeling,* 5th edition, Pearson Education, 2015.
2. George F. Simmons, *Differential Equations with Applications and Historical Notes*, 3rd edition, CRC Press, Taylor & Francis, 2017.

SUGGESTED WEB SOURCES:
1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course Differential Equations

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	3	2	3	3	3	3	2	2
CO2	3	2	3	3	2	2	3	2	3	3	2	3	2	2
CO3	3	2	3	3	2	3	3	2	3	3	3	3	3	2
CO4	3	2	3	3	2	3	3	3	3	3	3	3	3	3
Average	3	2	3	3	2	2.5	3	2.25	3	3	2.75	3	2.5	2.25

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Discipline Specific Course (DSC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER -II
CODE: BMH23-204
SUBJECT NAME: Differential Equations (Lab)
NO. OF CREDITS: 1

		Internal Assessment:	10
L	P	End Semester:	15
0	2	Total:	25

COURSE OUTCOMES:
Students will be able to
CO1: Write a computer program for finding the solution of differential equations.
CO2: Write a computer program for plotting a family of solutions of differential equations of various orders.
CO3: Write a computer program for finding the particular solution of differential equations using the method of variation of parameters.
CO4: Write a computer program for different types of mathematical models.

List of practical (using any software):
1. Plotting solutions of first order differential equations
2. Plotting solutions of second order differential equations.
3. Plotting solutions of third order differential equations.
4. Solution of differential equations using method of variation of parameters.
5. Exponential growth model.
6. Exponential decay model.
7. Lake pollution model.
8. Limited growth of population (with and without harvesting).

TEXT BOOKS
1. Belinda Barnes and Glenn R. Fulford, *Mathematical Modeling with Case Studies: A Differential Equation Approach Using Maple and MATLAB*, 3rd edition, CRC Press, Taylor & Francis, 2015.
2. C. Henry Edwards, David E. Penny and David T. Calvis, *Differential Equations and Boundary Value Problems: Computing and Modeling,* 5th edition, Pearson Education, 2015.

CO-PO and CO-PSO matrix for the course Differential Equation Lab

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	3	2	3	2	3	3	2	3	2	2	3	3	3
CO2	3	3	2	3	2	3	3	2	3	2	2	3	1	2
CO3	3	3	2	3	2	3	3	2	3	2	2	3	2	2
CO4	3	3	2	3	2	3	3	2	3	2	3	3	3	2
Average	3	3	2	3	2	3	3	2	3	2	2.25	3	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Discipline Specific Course (DSC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER -II
CODE: BMH23-204
SUBJECT NAME: Introduction to Operating Syatem
NO. OF CREDITS: 3

		Internal Assessment:	10
L	P	End Semester:	15
3	0	Total:	25

Course Objectives:
CO1: To understand evolution and types of OS and to understand the structure, components and functions of OS.
CO2: To learn about Processes, threads and various Scheduling policies.
CO3: To understand the principle of Deadlocks and various memory management schemes
CO4: To understand virtual memory management, Disk management, I/O management and File system

UNIT – I : Fundamentals of Operating System
Introduction to Operating System, its need and operating System services, Early systems, Structures - Simple Batch, Multi programmed, timeshared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Process Management: Process concept and context, Process Control Block, Operation on processes,Threads, and Inter-process Communication
.
UNIT-II: CPU Scheduling Basic concepts, scheduling criteria, scheduling algorithms: FCFS, SJF, Premptive and non-premptive, Round Robin,& Queue Algorithms.
Deadlocks: Deadlock characterization, Prevention and Avoidance, Deadlock Detection and Recovery Methods for handling deadlocks, Banker's Algorithm.

UNIT-III: Memory Management
Logical versus Physical address space, Swapping, Contiguous allocation, Paging, Segmentation.
Virtual Memory: Demand paging, Performance of demand paging, Page replacement, Page replacement algorithms, Thrashing.

UNIT-IV: Disk Scheduling and File Management
Disk structure, Disk Scheduling Algorithms: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK.
Type of File systems, File Structure, File allocation methods: Contiguous allocation, Linked allocation, Indexed allocation, Free space management: Bit vector, Linked list, Grouping, Counting.

Text Books:
1. Abraham Silberschatz, PeterB.Galvin,—Operating System Concepts‖ ,Addison Wesley publishing. Co.,7th. Ed., 2004.
2. Nutt Gary, "Operating Systems",Addison Wesley Publication,2000.

Reference Books:

1. Andrew S.Tannenbaum, "Modern Operating Systems", Pearson Education Asia, Second Edition, 2001.
2. William Stallings, "Operating Systems, "Internals and Design Principles", 4th Edition,PH, 2001.

SUGGESTED WEB SOURCES:
1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources.

CO-PO and CO-PSO matrix for the course Introduction to Operating System

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	3	2	3	3	3	3	2	2
CO2	3	2	3	3	2	2	3	2	3	3	2	3	2	2
CO3	3	2	3	3	2	3	3	2	3	3	3	3	3	2
CO4	3	2	3	3	2	3	3	3	3	3	3	3	3	3
Average	3	2	3	3	2	2.5	3	2.25	3	3	2.75	3	2.5	2.25

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Minor Course (MIC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER-II
CODE: BMH23-205
SUBJECT NAME: Probability and Statistics -II
NO. OF CREDITS: 4

Internal Assessment:25
End Semester: 75
Total: 100

L   P
4   0

COURSE OUTCOMES:
This course will enable the students to
CO1: Explore distributions in the study of the joint behavior of two random variables.
CO2: Acquire mathematical and statistical knowledge of various distributions like Binomial,
        Poisson and Normal
CO3: Acquire knowledge about the curve fitting
CO4: Learn basic Hypothesis testing

UNIT-I
 Probability Distribution: Random variable, Discreterandom variable, Cumulative distribution function, Expectation and variance of discrete random variable, Binomial and poisson distribution, Continuous random variable, Probability density function, Expectation and variance of continuous random variable, Normal distribution.

UNIT-II
 Bivariate Distribution: Joint probability, Joint probability mass function, Marginal and conditional probability function, Joint probability distribution function, Joint continuous density function, Marginal and conditional probability density function, Conditional cumulative distribution.

UNIT-III
Curve Fitting: Introduction, Principle of least squares, Fitting of straight line, Fitting a second degree parabola, Fitting of an exponential curve $= ae^{bx}$

UNIT-I
Hypothesis Testing: Introduction, Null hypothesis, Alternative hypothesis, Level of significance, Hypothesis testing for large samples (Test for single mean, Test for difference of means), Test for single proportion, Test for difference of proportions, T-test.

TEXT BOOKS

1. Irwin Miller &Marylees Miller, John E. Freund's Mathematical
        Statistics with Applications (8th edition). Pearson. Dorling Kindersley Pvt. Ltd. India,2014.
2.   Gupta S.C. and Kapoor V.K., Fundamentals ofMathematical Statistics, **S.** Chand Pub., New

Delhi.,1970.

REFERENCE BOOKS

1. Robert V. Hogg, Joseph W. McKean & Allen T. Craig ,Introduction to   Mathematical
    Statistics ,7th edition, Pearson Education, 2013.
2. Jim Pitman, Probability, Springer-Verlag, 1993.
3. Sheldon M. Ross, Introduction to Probability Models ,11th edition, Elsevier, 1993.
4. A. M. Yaglom and I. M. Yaglom, Probability and Information. D. Reidel Publishing Company. Distributed
        by Hindustan Publishing Corporation (India) Delhi, 1993.

SUGGESTED WEB SOURCES:

1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion,
assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms,
DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources

CO-PO and CO-PSO matrix for the course Probability and Statistics –II

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	1	2	2	3	2	2	1	2
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	2
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.75	2.5	2.8	2.3	2.3

Multidisciplinary Course (MDC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER-II
CODE: OPHY23-201
SUBJECT NAME: Mechanics
NO OF CREDITS: 2

		Internal Assessment:	25
L	P	End Semester:	75
2	0	Total:	100

COURSE OUTCOMES:
After the completion of the course, students will be able to,
   CO1:   Have knowledge of fundamentals of Mechanics
   CO2:   Have an understanding of rotational dynamics
   CO3:   Explore the laws of gravitation and central force motion
   CO4:   Know relative variation of length, mass and time with the velocity of an event
   CO5:   Analyze elasticity and various elastic parameters

UNIT-I
Vectors: Vector algebra, Scalar and vector products. Derivatives of a vector with respect to a parameter, Ordinary Differential Equations: 1st order homogeneous differential equations, 2nd order homogeneous differential equations with constant coefficients, Momentum and Energy**:** Conservation of momentum, Work and energy, Conservation of energy, Motion of rockets.

UNIT-II
Laws of Motion: Frames of reference, Newton's Laws of motion, Dynamics of a system of particles, Centre of Mass, Rotational Motion: Angular velocity and angular momentum, Torque, Conservation of angular momentum.

UNIT-III
Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant), Kepler's Laws (statement only), Satellite in circular orbit and applications, Oscillations: Simple harmonic motion, Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Damped oscillations

UNIT-IV
Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of Rigidity modulus and moment of inertia - Y, η and K by Searles method.
peed Theory of Relativity**:** Constancy of speed of light. Postulates of Special Theory of Relativity.Length contraction.Time dilation.Relativistic addition of velocities.

TEXT BOOKS
1. University Physics. FW Sears,MWZemansky& HD Young 13/e, Addison-Wesley,1986.
2. Mechanics Berkeley Physics course, v.1:CharlesKittel, et.al. 2007, Tata McGraw-Hill
3. Physics – Resnick, Halliday& Walker 9/e, Wiley, 2010.

REFERENCE BOOKS
1. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., Oxford University Press, 2015.
2. University Physics, Ronald Lane Reese, Thomson Brooks/Cole, 2003.

SUGGESTED WEB SOURCES:

1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources

CO-PO and CO-PSO matrix for the course Mechanics

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	1	2	2	3	2	2	1	2
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	2
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.75	2.5	2.8	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Multidisciplinary Course (MDC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER-II
CODE: OEC-CE-1013
SUBJECT NAME: Fundamentals of Database System
NO OF CREDITS: 2

		Internal Assessment:	25
L	P	End Semester:	75
2	0	Total:	100

COURSE OUTCOMES:

The students will be able to

CO1: Explore the basic concepts, applications and architecture of database systems

CO2: Master the basics of ER diagram

CO3: Know relational database algebra expressions and construct queries using SQL

CO4: Analyze sound design principles for logical design of databases, normalization

UNIT-I

Database: Introduction to database, relational data model, DBMS architecture, data independence, DBA, database users, end users, front end tools.

UNIT-II

Modeling: Entity types, entity set, attribute and key, relationships, relation types, E- R diagrams, database design using ER diagrams.

UNIT-III

Relational Data Model: Relational model concepts, relational constraints, primary and foreign key, normalization: 1NF, 2NF, 3NF.

TEXT BOOKS

1. Fundamentals of Database Systems by R. Elmasri and S.B. Navathe, 3 rd edition, Addision- Wesley, Low Priced Edition,2000.
2. An Introduction to Database Systems by C.J. Date, 7 th edition, Addison-Wesley, Low Priced Edition, 2000.
3. Database Management and Design by G.W. Hansen and J.V. Hansen, 2 nd edition, Prentice- Hall of India, Eastern Economy Edition,1999.

REFERENCE BOOKS

1. Database Management Systems by A.K. Majumdar and P. Bhattacharyya, 5 thedition,Tata McGraw-Hill Publishing. , 1999.
2. P. Rob, C. Coronel, Database System Concepts by, Cengage Learning India, 2008.
3. R. Elmsasri,S. Navathe Fundamentals of Database Systems, Pearson Education, Fifth Edition, 2007. 9. MySQL : Reference Manual.

SUGGESTED WEB SOURCES:

1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources

CO-PO and CO-PSO matrix for the course Fundamentals of Database System

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	1	2	2	3	2	2	1	2
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	2
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.75	2.5	2.8	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Multidisciplinary Course (MDC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER-II
CODE: BCH-S-201
SUBJECT NAME: Chemistry II
NO OF CREDITS: 2

		Internal Assessment:	25
L	P	End Semester:	75
2	0	Total:	100

COURSE OUTCOMES
After the successful completion of the course the learner would be able to
CO1: Explore the basic concept chemical thermodynamics
CO2: Analyze chemical ionic equilibrium Know
CO3: Know phase equilibrium
CO4: Know aboutcongruent and incongruent points

UNIT-I

Review of thermodynamics and the Laws of Thermodynamics, Important principles and definitions of thermochemistry, Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution, Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, Variation of enthalpy of a reaction with temperature – Kirchhoff"s equation, Statement of Third Law of thermodynamics and calculation of absolute entropies of substances, Concept of EMF of a cell, Nernst equation and its importance, Types of electrodes, Standard electrode potential. Electrochemical series, Thermodynamics of a reversible cell, calculation of thermodynamic properties: G, H and S from EMF data.

UNIT-II

Free energy change in a chemical reaction, Thermodynamic derivation of the law of chemical equilibrium, Le Chatelier"s principle and Relationships between Kp, Kc and Kx for reactions involving ideal gases. Phases, components and degrees of freedom of a system, criteria of phase equilibrium, Gibbs Phase Rule and its thermodynamic derivation, Derivation of Clausius–Clapeyron equation and its importance in phase equilibria, Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics, congruent and incongruent melting points (lead- silver, $FeCl_3$-H_2O and Na-K only).

TEXT BOOKS
1. G. M. Barrow: Physical Chemistry Tata McGraw Hill, 2007.
2. G. W. Castellan: Physical Chemistry 4th Edn. Narosa, 2004.
3. J. C. Kotz, P. M. Treichel& J. R. Townsend: General Chemistry CengageLeningIndia Pvt. Ltd., New Delhi, 2009.

REFERENCE BOOKS
1. B. H. Mahan: University Chemistry 3rd Ed. Narosa, 1998.

2. R. H. Petrucci: General Chemistry 5th Ed. Macmillan Publishing Co.: New York, 1985.

SUGGESTED WEB SOURCES:
1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources

CO-PO and CO-PSO matrix for the course Chemistry-II

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	1	2	2	3	2	2	1	2
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	2
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.75	2.5	2.8	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Multidisciplinary Course (MDC)
B.Sc.MATHEMATICS & COMPUTING
SEMESTER-II
CODE: OPHY23-202
SUBJECT NAME: Mechanics (Lab)
NO OF CREDITS: 1

L	P
0	2

Internal Assessment: 15
End Semester: 35
Total: 50

At least 5 experiments from the following:

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope
2. To determine the Height of a Building using a Sextant
3. To determine the Moment of Inertia of a Flywheel
4. To determine the Young's Modulus of a Wire by Optical Lever Method
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the Elastic Constants of a Wire by Searle's method
7. To determine g by Bar Pendulum
8. To determine g by Kater's Pendulum
9. To study the Motion of a Spring and calculate (a) Spring Constant, (b) g.

REFERENCE BOOKS
1. Advanced Practical Physics for students, B.L.Flint and H.T. Worsnop, Asia Publishing House, 1971.
2. A Text Book of Practical Physics, InduPrakash and Ramakrishna, 11th Edition, KitabMahal, New Delhi, 2011.
3. Engineering Practical Physics, S. Panigrahi and B.Mallick, Cengage Learning India Pvt. Ltd., 2015.

CO-PO and CO-PSO matrix for the courseMechanics Lab

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	3	2	3	2	3	3	2	3	2	2	3	3	3
CO2	3	3	2	3	2	3	3	2	3	2	2	3	1	2
CO3	3	3	2	3	2	3	3	2	3	2	2	3	2	2
CO4	3	3	2	3	2	3	3	2	3	2	3	3	3	2
Average	3	3	2	3	2	3	3	2	3	2	2.25	3	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Multidisciplinary Course (MDC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER-II
CODE: OEC-CE-1014
SUBJECT NAME: Fundamentals of Database System (Lab)
NO OF CREDITS: 1

		Internal Assessment:	25
L	P	End Semester:	35
0	2	Total:	50

UNIT 1:

Create a database having two tables with the specified fields, to computerize a library system of a Delhi University College.
Library Books (Accession number, Title, Author, Department, Purchase Date, Price) Issued Books (Accession number, Borrower)
  a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
  b) Delete the record of book titled "Database System Concepts".
  c) Change the Department of the book titled "Discrete Maths" to "CS".
  d) List all books that belong to "CS" department.
  e) List all books that belong to "CS" department and are written by author "Navathe".
  f) List all computer (Department="CS") that have been issued.
  g) List all books which have a price less than 500 or purchased between "01/01/1999" and "01/01/2004".

UNIT 2:

Create a database having three tables to store the details of students of Computer Department in your college. Personal information about Student (College roll number, Name of student, Date of birth, Address, Marks (rounded off to whole number) in percentage at $10 + 2$, Phone Number) Paper Details (Paper code, Name of the Paper) Student's Academic and Attendance details (College roll number, Paper code, Attendance, Marks in home examination).
  a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
  b) Design a query that will return the records (from the second table) along with the name of student from the first table, related to students who have more than 75% attendance and more than 60% marks in paper
  c) List all students who live in "Delhi" and have marks greater than 60 in paper1. d) Find the total attendance and total marks obtained by each student. e) List the name of student who has got the highest marks in paper2.

UNIT 3:

Create the following tables and answer the queries given below: Customer (Cust ID, email, Name, Phone, Referrer ID) Bicycle (Bicycle ID, Date Purchased, Color, Cust ID, Model No) Bicycle Model (Model No, Manufacturer, Style) Service (Start Date, Bicycle ID, End Date)
  a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
  b) List all the customers who have the bicycles manufactured by manufacturer "Honda".
  c) List the bicycles purchased by the customers who have been referred by customer "C1".

d) List the manufacturer of red colored bicycles. e) List the models of the bicycles given for service.

UNIT 4:

Create the following tables, enter at least 5 records in each table and answer the queries given below. EMPLOYEE (Person Name, Street, City) WORKS (Person Name, Company Name, Salary) COMPANY (Company Name, City) MANAGES (Person Name, Manager Name)

  a) Identify primary and foreign keys.
  b) Alter table employee, add a column "email" of type varchar(20).
  c) Find the name of all managers who work for both Samba Bank and NCB Bank.
  d) Find the names, street address and cities of residence and salary of all employees who work for "Samba Bank" and earn more than $10,000.
  e) Find the names of all employees who live in the same city as the company for which they work.
  f) Find the highest salary, lowest salary and average salary paid by each company.
  g) Find the sum of salary and number of employees in each company.
  h) Find the name of the company that pays highest salary.

CO-PO and CO-PSO matrix for the courseFundamentals of Database System Lab

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	3	2	3	2	3	3	2	3	2	2	3	3	3
CO2	3	3	2	3	2	3	3	2	3	2	2	3	1	2
CO3	3	3	2	3	2	3	3	2	3	2	2	3	2	2
CO4	3	3	2	3	2	3	3	2	3	2	3	3	3	2
Average	3	3	2	3	2	3	3	2	3	2	2.25	3	2.3	2.3

  **Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Multidisciplinary Course (MDC)
SEMESTER II
B.Sc. MATHEMATICS & COMPUTING
CODE: BCH-S-202
SUBJECT NAME: CHEMISTRY II(LAB)
NO. OF CREDITS: 1

		SESSIONAL	: 15
L	P	FINAL EXAM	: 35
0	2	TOTAL	: 50

The students have to perform at least 4 experiments from the following

1. Determination of enthalpy of ionization of Ethanoic acid.

2. Study of solubility of benzoic acid in water and determination of enthalpy change.

3. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.

4. Determination of surface tension and viscosity.

5. Determination of EMF using Potentiometry.

6. Determination of cell constant and conductance of a solution.

REFERENCE BOOKS
 1. G. M. Barrow: Physical Chemistry Tata McGraw Hill (2007).
2. G. W. Castellan: Physical Chemistry 4th Edn. Narosa (2004).
3. J. C. Kotz, P. M. Treichel& J. R. Townsend: General Chemistry CengageLening India Pvt. Ltd., New Delhi (2009).
4. B. H. Mahan: University Chemistry 3rd Ed. Narosa (1998).
5. R. H. Petrucci: General Chemistry 5th Ed. Macmillan Publishing Co.: New York (1985).

CO-PO and CO-PSO matrix for the course Chemistry Lab- II

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	3	2	3	2	3	3	2	3	2	2	3	3	3
CO2	3	3	2	3	2	3	3	2	3	2	2	3	1	2
CO3	3	3	2	3	2	3	3	2	3	2	2	3	2	2
CO4	3	3	2	3	2	3	3	2	3	2	3	3	3	2
Average	3	3	2	3	2	3	3	2	3	2	2.25	3	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Ability Enhancement Course (AEC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER- I
CODE: AEC-102-N1
SUBJECT NAME: Communication Mediationand Resolution
NO OF CREDITS: 2

	Internal Assessment: 25
L P	End Semester: 75
2 0	Total: 100

Course Outcomes:
CO1: Students will revise grammar basics for correct and effective writing.
CO2: Students will learn organising techniques for formal writing.
CO3: Students will learn the art of essay writing and drafting of proposals.
CO4: Students will be able to draft proposals fine-tuned to corporate requirements**.**

Unit-I:
Writing Skills and Basics of Grammar: Subject-verb agreement; sentence correction; tense-verb usage; Composition of a Paragraph; Characteristics of a Good Paragraph; Use of Idioms and Proverbs, Literary Tropes and Use of Figures of Speech.

Unit-II:
Technical Writing and Reports:SPSE structure; IMRD structure; Report Writing: Types of Reports and Structure of a Long Report.
Definitions; Comparisons and Contrasts; Hedging; Nominalization, Proposal Presentations; Memos; Agenda and MoM; Case Study Method; Business Letters-quotation and placing order

Unit-III:
Drafting proposals:
From essays to proposals; Types of Essay Writing:Structure of an essay; Argumentative essays; Expository essays; Narrative essays; and Descriptive essays;Structure of an Essay; Reading, Writing and Comprehension. Drafting proposals;Synopsis Writing;

Unit-IV: Exercises in Proposal Presentations: Drafting and Presenting Proposals.

TEXT BOOKS
1. Raman Sharma, Technical Communication, Oxford Publication, London.
2. Sharma, R. and Mohan, K. Business Correspondence and Report Writing TMH New Delhi.
3. Practical English Usage. Michael Swan. OUP.

REFERENCE BOOKS
1. On Writing Well. William Zinsser. Harper Resource Book.
2. Remedial English Grammar. F.T.Wood. Macmillan.

SUGGESTED WEB SOURCES:
1. https://nptel.ac.in/
2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion, assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms, DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources

CO-PO and CO-PSO matrix for the course Communication, Mediation and Resolution

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	1	2	2	3	2	2	1	2
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	2
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.75	2.5	2.8	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Skill Enhancement Course (SEC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER- II
CODE:OEC-CE-1015
SUBJECT NAME: Basic of Python
NO OF CREDITS: 3

		Internal Assessment:	25
L	P	End Semester:	50
3	0	Total:	75

COURSE OUTCOMES:

Students will be able to
CO1: Understand the fundamentals of Python
CO2:Use loops and understand the conditional flow of control
CO3: Make use of functions in Python
CO4: Understand the basics of Object Oriented Programming & Exception Handling

UNIT 1: BASICS OF PYTHON
 Introduction To Python,Its applications , Data Types (primitive and non-primitive data types), Understanding Python variables, Python basic Operators,Understanding python blocks, Using stringdata type and string operations.

UNIT 2: FLOW CONTROL IN PYTHON
Understanding Program Flow Control, Conditional blocks using if, else and elif, simple for loops inpython, For loop using ranges, string ,Use of while loops in python, Nested Loops, Loop manipulation using pass,continueand break. Programming using Python conditional and loops block.

UNIT 3: FUNCTIONS & MODULES
Understanding Python Functions, Types of Arguments, Lambda Function (need & use), Modules, Organizing python projects into modules Importing own module aswell as external modules , Basic understanding Packages.

UNIT 4 : CONCEPTS OF OOP
Python Object Oriented Programming,Concept of class, object andinstances, Constructor, class attributes and destructors, Inheritance, overlapping and overloadingoperators, Basics of Exception Handling Mechanism.

TEXT BOOKS

1.   Python Programming using Problem Solving Approach—ReemaThareja, Oxford
     university Press

REFERENCE BOOKS
1. Head First Python, A brain friendly guide – Paul Barry, O reilly, 2nd Edition.
2. A byte of Python- C.H. Swaroop

SUGGESTED WEB SOURCES:
   1. https://nptel.ac.in/
   2. https://swayam.gov.in/

MODE OF TRANSACTION: Lecture, demonstration, E-tutoring, discussion,
assignments, quizzes, case study, power point; **LMS/ICT Tools:** Digital Classrooms,
DLMS, ZOOM, G-Suite, MS Power-Point, Online Resources

CO-PO and CO-PSO matrix for the course Basic of Python

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	3	2	2	1	2	2	3	2	2	1	2
CO3	3	3	3	3	2	2	3	2	2	3	2	3	2	2
CO4	3	3	2	2	3	3	3	3	3	3	3	3	3	2
Average	3	2.75	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.75	2.5	2.8	2.3	2.3

**Mapping Scale: 1 to 3 (3: Strong correlation; 2: medium correlation; 1: weak correlation)

Value Added Course (VAC)
B.Sc. MATHEMATICS & COMPUTING
SEMESTER- II
CODE: VAC-103-N1
SUBJECT NAME: YOGA AND MEDITATION
NO OF CREDITS: 2

L	P		Internal Assessment:	25
3	0		End Semester:	50
			Total:	75

Course Outcomes:
CO1: Students will be able to know about YOGA.
CO2: Students will learn Meditation
CO3: Students will learn Pranayam
CO4: Students will be able to do Aasan.

UNIT-I
Introduction to yoga and its different levels, food habits, Sanskar of a yogi, PatanjaliYogsutra, its importance in life, benefits and history of yoga.

UNIT-II
Meditation and its relation with yoga, mind relaxation, development of morality and ethics, prayer and its meaning, its importance in life, benefits and history of meditation. Mantra and their importance, introduction to some chanting mantras, practicing some of mantras, Gayatri Mantra, NamokarJaap etc.

UNIT-III
Pranayam and its introduction, types of pranayam, breathing exercises, preliminary preparation before pranayam, its importance and benefits in life. Practice of different types of Pranayam: Anulom-Vilom, Kapalbhati, NadiShodhan, Agni Sar, Bhastrika, Bharamari etc.

UNIT-IV
Aasan and their types, benefits of different aasans, practicing of different aasans: Padamaasan, surya-namaskar, tadaasan, navaasan, gomukhaasan, bhujangaasan etc.

TEXT BOOKS
1. PATANJALI YOGSUTRA – GITA PRESS GORAKHPUR

REFERENCE BOOKS
1. AASAN PRANYAM MUDRA BANDH – SATYANANDA SARASWATI

2. YOGA SADHNA -SWAMI RAMDEV