(A) DISCIPLINE SPECIFIC CORE COURSES SEMESTER I & II

S.NO.	SEMESTER	CORE SUBJECT CODE	PAPER TITLE	CREDITS	MARKS	
					SEE	IA
1	I	MMCS101	**DIFFERENTIAL CALCULUS**	4	80	20
2	II	MMCS201	INTEGRAL CALCULUS	4	80	20

(B) OPEN ELECTIVE COURSES SEMESTER I & II

FOR STUDENTS OTHER THAN B.SC. (HONS.)

S No.	Semester	Course Code	Paper Title	Credit	Marks
1	I	GROUP A (Any One)	1) Quantitative Aptitude I 2) Logical Reasoning.	2 2	50 50
2	II	GROUP A	1) 1) Mathematical and Computational Thinking	2	50
		GROUP B	1) Business Mathematics I	2	50

(C)VOCATIONAL SKILL COURSES/SKILL ENHANCEMENT COURCES
SEMESTER I & II

Semester	Course Code	Name Of Course	Credit	Marks
I	VSE SEC	Computational Mathematics Laboratory (Practical) Probability (Theory)	2 2	50 50
II	VSE SEC	Python Programming (Practical) Mathematical Modelling	2 2	50 50

(D) ABILITY ENHANCEMENT COMPULSORY COURSES(AECC)

SEMESTER I & II

Semester	Course code	Name of course	Credit	Marks
I	AECC	English/Marathi/Hindi/Pali	2	50
II	AECC	English/Marathi/Hindi/Pali	2	50

(E) VALUE EDUCATION COURSE SEMESTER I &II

Semester	Course code	Name of course	Credit	Marks
I	VEC	Environment studies	2	50
II	VEC	Constitution of India: Rights and Duties	2	50

(F) INDIAN KNOWLEDGE SYSTEM(IKS) SEMESTER I

Semester	Course code	Name of course	Credit	Marks
I	MMIKS-108	Generic IKS	2	50

(G) CO-CURRICULAR COURSES (CC) SEMESTER I & II

Semester	Course code	Name of course	Credit	Marks
I	CC	YOGA/SPORTS/CULTURAL/NSS/NCC/HEALTH/CARE	2	50
II	CC	YOGA/SPORTS/CULTURAL/NSS/NCC/HEALTH/CARE	2	50

SYLLABUS
DISCIPLINE SPECIFIC CORE COURSES SEMESTER I
GROUP I : DIFFERENTIAL CALCULUS

Total Marks: 100 (Theory: 80, Internal Assessment: 20) Workload: 4 Lectures Theory (per week) Credits: 4 Duration: 15 Weeks (60 Hrs.) Examination: 3 Hrs.

Learning Objectives: The primary objective of this course is:

- To introduce the basic tools of calculus
- To provide a way of viewing and analysing the real-world.

Learning Outcomes: This course will enable the students to understand:

1) The notion of limits, continuity and uniform continuity of functions.
2) Recognize basic concepts of derivatives.
3) Understand the consequences of various mean value theorems for differentiable functions. Applications of derivative, relative extrema and mean value theorems.
4) Taylor's theorem, differentiation up to n times, Leibnitz theorem Partial Differentiation.

UNIT I Limit and continuity (ε and δ definition). Types of discontinuities, theorems on limit and continuity. Differentiability of functions. Mean Value theorem, Roll's theorem, Cauchy's generalized mean value theorem, Lagrange's mean value theorem.

UNIT II Taylors theorem with Lagrange's &Cauchy's form of remainder, Maclaurins Series &Taylors Series of sin x , cos x e^x ,log (1+ x), $(1+ x)^m$ Limit and continuity of functions of two variables,

UNIT III nth Derivatives of Standard functions e^{ax+b}, $(ax + b)^n$, $\log(ax + b)$, $\sin(ax + b)$, $\cos(ax + b)$, $e^{ax} \sin(bx + c)$, $e^{ax} \cos(bx + c)$, Leibnitz theorem and its applications.

UNIT IV. Partial Differentiation, Differential, and Chain rule. Homogeneous function, Euler's theorem, Jacobian , Maxima & minima, Lagrange's Multiplier method , The differential, Taylor's theorem for function of two variables.

References

1. H. Anton, I.birens and S.Davis, Calculus , John Wiley and Sons,Inc.,2002.
2. Differential Calculus - Shanti Narayan, S. Chand & Company, NewDelhi, 1998.
3. G.B. Thomas and R. L. Finney, Calculus, Pearson Education,2007. 14th edition.
4. Text Book of Differential Calculus –Gorakh Prasad

SYLLABUS
DISCIPLINE SPECIFIC CORE COURSES SEMESTER II
GROUP II : INTEGRAL CALCULUS

Total Marks: 100 (Theory: 80, Internal Assessment: 20) Workload: 4 Lectures Theory (per week) Credits: 4 Duration: 15 Weeks (60 Hrs.) Examination: 3 Hrs.

Learning Objectives: The primary objective of this course is:

- To introduce the basic tools of calculus
- To provide a way of viewing and analyzing the real-world.

Learning Outcomes: This course will enable the students to :

1)Evaluate integrals of different rational and irrational functions

2)Derive Reduction formulae for some complex integrations and hence Integrate functions of a much higher degree which are applicable in real life situations.

3)Apply the integral calculus to find arc length of a curve, arc length of parametric curves, area under a curve, surface area and volume of surface of revolution.

4) Learn Riemann's definition of integrability and its Equivalence with Darboux definition of integrability along with the Necessary and sufficient condition for Riemann integrability. Understand the Statement of Abel's and Dirichlet's test for convergence on the integral of a product. Develop an idea of convergence and working knowledge of Beta and Gamma and their interrelation. Compute different integrals when they exist.

UNIT I Techniques of Integration by method of substitution, Partial Fraction , Integration by Parts, Reduction Formulae- $\int \sin^n x \, dx$, $\int \cos^n x \, dx$, $\int \sin^n x \, \mathrm{Cos}^n x \, dx$ likewise.

UNIT II Recapitulation Of Definite Integrals And Its Properties, Area between the two curves and mean value theorem for definite integral.

UNIT III Riemann integral, Integrability of continuous and monotonic functions, Fundamental theorem of integral calculus, First mean value theorem, Bonnet and Weierstrass forms of second mean value theorems.

UNIT IV Convergence of improper integrals, comparison tests, absolute convergence, Abel's and Dirichlet's tests. Frullani's Integrals. Definition & convergence of Beta & Gamma functions and their properties, duplication formula, inter-relation.

REFERENCES

1. H. Anton, I.birens and S.Davis, Calculus , John Wiley and Sons, Inc.,2002.
2. G.B. Thomas and R. L. Finney, Calculus, Pearson Education,2007. 14th edition.

3. Integration for degree student –Dr.P.K.Mittal, S. Chand & Co. New Delhi.
4. Wilfred Kaplan & D.J.Lewis,Calculus & linear algebra combined edition.
5. Prof. T.M. Karade and M.S. Bendre, Calculas and Differential Equations Sonu,Nilu,Nagpur

SYLLABUS

OPEN ELECTIVE (OE)COURSES SEMESTER I
MMOE-102 : QUNTITAVIE APPTITIUD I
FOR STUDENTS OTHER THAN B.SC. (HONS.)

Total Marks: 50 (Theory: 40, Internal Assessment: 10) Workload: 2 Lectures (per week), Duration: 15 Weeks (30 Hrs.) Examination: 2Hrs.

Course Objectives: The main aim of this course is to gain knowledge of elementary ideas about arithmetic abilities which one finds in daily life. It will help the students from any background to get acquainted with this knowledge and get prepared for any competitive examinations.

Course Learning Outcomes: This course will enable the students to: i) gain sufficient ideas of mental and arithmetic abilities.
ii) handle mental/quantitative aptitude test questions with great ease. iii) acquire the skill of solving problems of daily life/business quickly.

UNIT 1- Number Systems , Decimal and Fractions , Simplification(Algebraic operations VBODMAS)

UNIT 2- LCM and HCF, Divisibility rules ,Surds & Indices, Square Roots and Cube Roots.

UNIT 3 Ratio, Proportion, Average, Percentages, Problems based on Ages

Unit-4: Problems on Trains, Time and Work, speed, Time and Distance ,Streams

Text Book:

1. Scope and treatment as in “Quantitative Aptitude”, S. Chand and Company Ltd. Ram Nagar, New Delhi (2007).
2. A Modern Approach To Verbal & Non Verbal Reasoning By R S Agarwal
3. Analytical and Logical reasoning By Sijwali B S
4. Quantitative aptitude for Competitive examination By R S Agarwal
5. Analytical and Logical reasoning for CAT and other management entrance test By Sijwali BS
6. Quantitative Aptitude by Competitive Examinations by Abhijit Guha 4 th edition
7. https://prepinsta.com/
8. https://www.indiabix.co

SYLLABUS
OPEN ELECTIVE (OE)COURSES SEMESTER I

MMOE-204 : Logical Reasoning

Total Marks: 50 (Theory: 40, Internal Assessment: 10) Workload: 2 Lectures (per week), Duration: 15 Weeks (30 Hrs.) Examination: 2Hrs.

Course Objectives: The main aim of this course is to gain knowledge of elementary ideas about arithmetic abilities which one finds in daily life. It will help the students from any background to get acquainted with this knowledge and get prepared for any competitive examinations.

Course Learning Outcomes: This course will enable the students to: i) Gain sufficient ideas of mental and arithmetic abilities.
ii) Handle mental/quantitative aptitude test questions with great ease.
iii) Acquire the skill of solving problems of daily life/business quickly.

Unit I Verbal Reasoning- Alpha-numerical sequence puzzle, Alphanumeric Series, Alphabet Test, Analogy, Arithmetical operations.

Unit II Assertion and reason, Blood relations, Logical sequence test, Logical Venn diagram, Sitting arrangement.

Unit III Logical Reasoning- Direction sense,family tree,Data Arrangment,Data Structure.

Unit IV- Mirror images, water Images, odd one one, pattern series and sequence, picture series and sequences, puzzles, seating arrangement.

1. A Modern Approach To Verbal & Non Verbal Reasoning By R S Agarwal
2. Analytical and Logical reasoning By Sijwali B S
3. Quantitative aptitude for Competitive examination By R S Agarwal
4. Analytical and Logical reasoning for CAT and other management entrance test By Sijwali B S
5. Quantitative Aptitude by Competitive Examinations by Abhijit Guha 4 th edition
6. https://prepinsta.com/
7. https://www.indiabix.com

SYLABUS

OPEN ELECTIVE (OE)COURSES SEMESTER II Group A

MATHEMATICAL AND COMPUTATIONAL THINKIN AND ANALYSIS

Total Marks: 50 (Theory: 40, Internal Assessment: 10) Workload: 2 Lectures (per week), Duration: 15 Weeks (30 Hrs.) Examination: 2Hrs.

Course Objectives- The main aim of this course is the ability to solve complex real-world problems by applying problem-solving skills and the knowledge gained from a broad education in Mathematics, Computing, Data Sciences, Humanities, Social Sciences, and other Physical and Biological Sciences

Course Learning Outcomes – This course will enable the students to: i) Explain and apply basic notions of symbolic logic. II) Display data graphically and interpret graphs: stemplots, histograms, and box plots.iii) Recognize, describe, and calculate the measures of the center of data: mean, median, and mode .iv) understand what probability is as well as associated concepts such as an event, an outcome, and a sample space,

Unit- 1 Logic: Statement, truth table, quantifiers, Connectives and tautology, Mathematical induction.

Unit 2- Sets : - Sets and their representations, Empty set, Finite and Infinite sets, equal Sets, subjects, Power set, Universal set , venn diagrams, Unionid Intersection of Sets. Difference of Sets , complement of a set.

Unit : -3 Basics of Statistics :- Data collection and presentation using bar chart, Column chart line chart, pie chart, scatter chart, calculation of frequency, Measure of central tendency, Mean, median and Mode.

Unit -4**: Permutation ,Combinations and probability**
Fundamental principle of counting, Factorial, permutation and combinations, simple applications. Random experiments, Introduction to probability, sample spaces (Set representation), events; the probability of an event, some rules of probability, Occurrences of events. 'not', 'AND','OR' events, exhaustive events, mutually exclusive events. Axiomatic (set theoretic) probability

Books Recommendation:

1 N.K. Singh Text book of probability and statistics, 1stedition, Pragati Publication, Meerut.
2. Probability and Statistics (4th Edition) 4th Edition MorrisH, Degroot(Author) Mark J, Schervish, Pearsion Education Limited 2014,
3. Arithmetic by Lalji Prasadd published by Students friends
4 Business Mathematics and Statistics, N.G. Das &Dr. J.K. DasMcGraw Hill New Delhi.
5 Fundamentals of Business Mathematics, M. K. Bhowal, Asian Books Pvt.Ltd New Delh.
6 Statistical Methods, Gupta S. P.: Sultan Chand andSons, New Delhi.
7 Fundamentals of Statistics, Goon A. M., Gupta, M. K. and Dasgupta,World Press Calcutta.
8 Statistical methods: An introductory text, New Age.

SYLABUS

OPEN ELECTIVE (OE)COURSES SEMESTER II Group B

MMOE-203 : BUSINESS MATHEMATICS I

Total Marks: 50 (Theory: 40, Internal Assessment: 10) Workload: 2 Lectures (per week), Duration: 15 Weeks (30 Hrs.) Examination: 2Hrs.

Course Objectives: The main aim of this course is to gain knowledge of elementary ideas about arithmetic abilities which one finds in daily life. It will help the students from any background to get acquainted with this knowledge and get prepared for any competitive examinations.

Course Learning Outcomes: This course will enable the students to: i) gain sufficient ideas of mental and arithmetic abilities.
ii) handle mental/quantitative aptitude test questions with great ease. iii) acquire the skill of solving problems of daily life/business quickly.

Unit-1 Problems on Profit & Loss, Percentage Calculation on Buying & Selling, Problems on Profit And Loss Finding Selling Price, Finding Cost Price, Profit And Loss Percentage & Proportion.

Unit-2: Simple Interest , Compound Interest ,Instalments,

Unit 3- Partnership, Mixtures and Allegation,

UNIT 4 - Stocks and Shares and dividends, Banker's discount. True Discount

Text Book:

1. Scope and treatment as in "Quantitative Aptitude", S. Chand and Company Ltd. Ram Nagar, New Delhi (2007).
2. A Modern Approach To Verbal & Non Verbal Reasoning By R S Agarwal.
3. Analytical and Logical reasoning By Sijwali B S
4. Quantitative aptitude for Competitive examination By R S Agarwal.

SYLLABUS

VOCATIONAL SKILL COURSES (VSE) SEMESTER I

COMPUTATIONAL MATHEMATICS LABORATORY.

Total Marks: 50 (Theory:Nil, Prctical 40 Internal Assessment: 10) Workload: 4 Lectures (per week), Duration: 15 Weeks (30 Hrs.) Examination: 2Hrs.

Course Objectives-
To learn basic skills for Microsoft PowerPoint.
To understand the general interface of PowerPoint, view various PowerPoint samples, and complete their own PowerPoint presntation.
To build an understanding of how to use excel from scratch and then gradually scale up to higher levels of competenc.

To equip the students with MS Excel features which will develop their foundation of using spreadsheets.
To provide insights into the data analysis tools in Excel so that they can extract meaningful information from vast arrays of data .
To familiarize students with the important functions and data visualization features available in Excel which help in performing data mining.

Course Outcome- This course will enable the students to:

- Create, edit, save, and print presentations.
- Format presentations.
- Add a graphic to a presentation.
- Create and manipulate simple slide shows with outlines and notes.
- Create slide presentations that include text, graphics, animation, and transitions.
- Use design layouts and templates for presentations.
- Create a PowerPoint presentation.
- The learner can prevent unintended or malicious intrusions over the workings.
- The learners are able to assign validations and protections excel based on templates and files Learners are able to create Pivot Tables and Pivot Charts
- The learner acquires knowledge about Conditional formatting COut 5 The learners can analyze Charts of various kinds,
- Learners is able to analyze more about Data Validation .
- The learner knows how to Protect the Workbook and Worksheet

Unit-I: PowerPoint Presentation Navigate the PowerPoint interface, creating new presentation from scratch – or by using beautiful templets, Add text, Pictures, Sound, Movies and Charts.

Unit II Designing slides using themes, colours and special effects, Animate objects on slides, work with Master slides to make presentation easy.

Unit -III: Spreadsheets Examine spreadsheet concepts and explore the Microsoft Office Excel environment, Create, Open and View a workbook. Save and print workbooks. Enter and Edit data. Modify a worksheet and workbook. Work with cell references.

Unit IV Learn to use functions and formulas. Create and edit charts and Graphics. Filter and sort table data. Work with pivot tables and charts. Import and Export data.

REFERENCES

1. Binder, Donald & Erickson, Martin (2011). A student's guide to the Study, Practice, and Tools of Modern Mathematics. CRC Press, Taylor & Francis Group, LLC.
2. Hillier and Hillier (2003). Introduction to Management Science: A Modeling and Case Studies Approach with Spreadsheet, Second Edition, McGraw-Hill

List of Practical to be performed at the Laboratory:

a) PowerPoint Presentation: 1. Change the fonts, colour of text on a slide 2. Add bullets or numbers to text 3. Format text as superscript or subscript 4. Insert a picture that is save on your local drive or an internal server 5. Insert a picture from the web 6. Insert shapes in your slide

b) Spreadsheet: 1. Format, enhance, and insert formulas in spreadsheet. 2. Move data within and between workbooks. 3. Maintain a workbook and create a chart in a spreadsheet. 4. Create, modify and manage a database table and query. 5. Create relationships between tables in a database. 6. Import and export data among word processing software, a spreadsheet and a database. 7. Merge data in a database with a word processing document.

SYLLABUS
SKILL ENHANCEMENT COURSES (SEC) SEMESTER I

PROBABILITY

Total Marks: 50 (Theory: 40, Internal Assessment: 10) Workload: 2 Lectures (per week), Duration: 15 Weeks (30 Hrs.) Examination: 2Hrs.

Course Objectives- To introduce key concepts that help to understand probability problem in simple words and different approaches to find numerical measure of probability for different probability problem.

Course outcome- Students are expected to be able

1. To distinguish between random and non-random experiments.
2 To find the probabilities of events.
3. To obtain a probability distribution of random variable (one or two dimensional) in the given situation, and
4. To apply standard discrete probability distribution to different situations

Unit I. Axioms of Probability- Introduction, Sample Epace and Events Axioms of Probability, Some simple propositions, sample spaces having equally likely outcomes ,probability as a continuous set function probability as a measure of bel

Unit II Conditional Probability and Independence.- Conditional Probabilities, Bayes's Formula Independent ,Events $P(\cdot|F)$ Is A Probability.

Unit III Radom Variables- Random Variables, Discrete Random Variables ,Expected Value , Expectation of a Function of A Random Variable ,Variance ,The Bernoulli and Binomial Random Variables ,The Poisson Random Variable ,other Discrete Probability Distributions ,Expected Value of Sums of Random Variables Properties of the Cumulative Distribution Function.

Unit IV Continuous Radom Variables- Expectation and variance of continuous random variables the uniform random variable normal random variables exponential random variable, other continuous distributions the distribution of a function of a random variable.

Reference Books:

1 Sheldon Ross – Introduction to Probability Model , 9th Ed. Academic Press Indian Reprint, 2007
2Robert V. Hogg, Joseph W. McKean and Allen T. Craig –Introduction to Mathematical Statistics , Pearson Education,Asia,2007.
3Irwin Miller and Marylees Miller , John E. Freund – Mathematical Statistic with Application , 7th Ed. Pearson Education , Asia, 2006
4.Mathematics Text Book for Class XII NCERT.
5.Mathematics and Statistics – Std. XII Maharashtra State Board of Secondary and Higher Secondary Education , Pun

SYLLABUS
VOCATIONAL SKILL COURSES (VSC) SEMESTER II

PYTHON PROGRAMMING

Total Marks: 50 (Theory:Nil, Prctical 40 Internal Assessment: 10) Workload: 4 Lectures (per week), Duration: 15 Weeks (30 Hrs.) Examination: 2Hrs.

Course Objectives- Learn Programming fundamentals using Python, Understand the concepts and usage data types, variables and other basic elements, Learn about using operators and control statements in Python, Learn about using arrays and strings Python.

Course Outcomes

1)The learner will be able to achieve proficiency in using and applying various data types including, string, array list, tuple anddictionary.
2) The learner is able to use regular expressions to perform complex operations in less cod
3)The learner learns to make use of date and time in Python for various applications.
4)The learner learns to Create a List ,Dictionary.
5) The learner learns Using Loop with Dictionaries.
6) The learner understands Input Functions, Output Statements.
7)The learner is able to work with Strings.

Unit I Introduction to Programming using Python Structure of a Python Program, Functions, Interpreter shell, Indentation. Identifiers and keywords, Literals, Strings, Basic operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment Operator, Bit wise operator).

Unit II Creating Python Programs. Input and Output Statements, Control statements:- branching, looping, Exit function, break, continue and pass, mutable and immutable structures. Testing and debugging a program.

Unit III. Visualization using 2D and 3D graphics and data structures Visualization using graphical objects like Point, Line, Histogram, Sine and Cosine Curve, 3D objects

Unit IV Built-in data structures: Strings, lists, Sets, Tuples and Dictionary and associated operations. Basic searching and sorting methods using iteration and recursion.

References:

1. Downey, A.B., (2015),Think Python–How to think like a Computer Scientist, 3rd edition. O'Reilly Media.

2. Taneja, S. &Kumar,N., (2017),Python Programming-A Modular Approach. Pearson Education.

Additional Reading:

1. Brown, M. C. (2001).The Complete Reference : Python, McGraw Hill Education.
2. Dromey, R. G. (2006),How to Solve it by Computer, Pearson Education.
3. Guttag, J.V.(2016),Introduction to computation and programming using Python. MIT Press. 4. Liang,Y.D. (2013),Introduction to programming using Python. Pearson Education.

Practical 1. Execution of expressions involving arithmetic, relational, logical, and bitwise operators in the shell window of Python IDLE.

2. Write a Python function to produce the outputs such as:

a) $1-x^2 /2! + x^{4/}/4!-x^6/6!+\ldots\ldots x^n/n!$

(b) $1-x^2 /2! + x^{4/}/4!-x^6/6!+\ldots\ldots x^n/n!$

3. Write a Python function that takes two strings as an input from the user and counts the number of matching characters in the given pair of strings.

4 Write a Python function that takes a string as an input from the user and displays itsreverse.

5. Write a Python function that takes a string as an input from the user and determines whether it is palindrome or not.

6. Write a Python function to calculate the sum and product of two compatible matrices

7. Write a function that takes a list of numbers as input from the user and produces the corresponding cumulative list where each element in the list present at index i is the sum of elements at index j <=i.

8. Write a function that takes n as an input and creates a list of n lists such that ith list contains first five multiples of i.

9. Write a function that takes a sentence as input from the user and calculates the frequency of each letter. Use a variable of dictionary type to maintain the count.

10. Write a Python function that takes a dictionary of word:meaning pairs as an input from the user and creates an inverted dictionary of the form meaning:list-of-words.

11. Usage of Python debugger tool-pydband Python Tutor.

12. Implementation of Linear and binary search techniques

13. Implementation of selection sort, insertion sort, and bubble sort techniques

14. Write a menu-driven program to create mathematical 3D objects Curve, Sphere, Cone, Arrow, Ring, and Cylinder.

15. Write a program that makes use of a function to accept a list of n integers and displays a histogram.

16. Write a program that makes use of a function to display sine, cosine, polynomial and exponential Ring, and Cylinder.

17. Write a program that makes use of a function to accept a list of n integers and displays a histogram.

18. Write a program that makes use of a function to display sine, cosine, polynomial and exponential curves.

19. Write a program that makes use of a function to plot a graph of people with pulse rate p vs. height h. The values of p and hare to be entered by the user.

20. Write a function that reads a file file1 and displays the number of words and the number of vowels in the file.

SYLLABUS
SKILL ENHANCEMENT COURSES (SEC) SEMESTER II

MATHEMATICAL MODELLING

Total Marks: 50 (Theory: 40, Internal Assessment: 10) Workload: 2 Lectures (per week), Duration: 15 Weeks (30 Hrs.) Examination: 2Hrs.

The objectives of this course are to:
Enable students understand how mathematical models are formulated, solved , and interpreted.
Make students appreciate the power and limitations of mathematics in solving practical real-life problems.
Equip students with the basic mathematical modelling skills.
Create a model that adequately describes the problem, using the appropriate technology if necessary.
Test the validity of the model.
Solve the problem using the appropriate technology if necessary.
Course outcome
Upon successful completion of this course -The student will be able to
Understand what a mathematical model is and explain the series of steps involved in a mathematical modeling process.
2. State and explain the different classifications of mathematical models stating examples in each class.
3. Explain the essential features of a good model and discuss the benefits of using a mathematical model.
4. Identify some simple real-life problems that can be solved using mathematical models, model the problem(s), solve the resulting problem, and interpret the solution.

Unit I Introduction, Preliminaries, Definition of mathematical modelling formation: Identifying the relevant factors, mathematical description, examples of mathematical modelling

Unit II Need of mathematical modelling, Principles of mathematical modelling , (steps for mathematical modelling), examples of mathematical modelling, limitations of mathematical modelling.

Unit III Applications of Differential equations: Vibration of mass on a spring , resonance phenomenon, mechanics of simultaneous differential equations .

Unit IV Application of traffic flow, vibrating string, gravitational potential, conservation laws.

Reference Books:

1. I. Snedon -Elements of Partial Differential Equations , McGraw Hill , International Ed. 1967
2. ShepleyL.Ross - Differential Equations ,3rd Ed. John Wiley and Sons.1984
3. Mathematics Text Book for Class XI and XII , NCERT