

MAU01 – 1st SEMESTER

Course Title/Code	CALCULUS – I(MAH108B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	Students will be able to understand and apply the concepts of Continuity, Differentiability and its applications.	
Course Outcomes (COs)		Mapping
CO1	Develop a foundation of elementary tools in Calculus: limit, continuity, differentiability & curve tracing.	Skill Development
CO2	Apply the concepts of limits, continuity & differentiability to pure and applied mathematics problems.	Skill Development
CO3	Use the properties of limits and the derivative to analyze graphs of various functions of single & several variable.	Skill Development
CO4	demonstrate concepts of curve tracing and curvature in various mathematical & engineering problems.	Skill Development
CO5	Recognize the appropriate tools of calculus to solve applied mathematical & engineering problems.	Skill Development
Prerequisites (if any)	N.A	

Section A

Limit & Continuity: Limit, Continuity, Continuous functions: Properties and theorems Differentiability of a function of single variable. Indeterminate forms. Mean value theorems: Rolle's Theorem, Cauchy's theorem and Lagrange theorem.

Section B

Successive Differentiation & Curvature: Successive Differentiation, Leibnitz Theorem, Taylor's and Maclaurin's Series. Curvature, Radius of curvature for Cartesian, parametric and Polar Curves, Radius of Curvature at the Origin, Evolutes.

Section C

Tracing of Curves : Asymptotes (Parallel and Oblique) of Cartesian, Polar and Parametric Curves, Intersection of Curve and its Asymptotes. Concavity & Convexity, Points of Inflexion, Multiple Points (Singular Points), Tracing of Curves in Cartesian, Parametric and Polar Form.

Section D

Functions of Several Variables : Limit, Continuity and Differentiability of a function of two variables, Partial Differentiation, Euler's theorem, Total Derivative, Maxima Minima of a function of two Variables, Jacobians, Taylor's theorem for a function of two variables, Differentiation under the Integral Sign .

TEXTBOOKS

1. Shanti Narayan , Differential Calculus, S.Chand & Co.

REFERENCE BOOKS

1. B.S.Grewal, Higher Engineering Mathematics Khanna Publications.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>P O1</u>	<u>P O2</u>	<u>P O3</u>	<u>P O4</u>	<u>P O5</u>	<u>P O6</u>	<u>P O7</u>	<u>P O8</u>	<u>P O9</u>	<u>PO 10</u>	<u>PO 11</u>	<u>PO 12</u>	<u>PO 13</u>
MAH108B	CALCULUS – I	<u>CO1</u>	3	3	3	3	2	-	2	-	2	-	-	2	-
		<u>CO2</u>	3	3	3	3	2	-	2	-	2	-	2	2	-
		<u>CO3</u>	3	3	3	3	2	-	2	-	2	-	-	2	-
		<u>CO4</u>	3	3	3	3	2	-	2	-	2	-	2	2	-
		<u>CO5</u>	3	3	3	3	1	-	3	-	2	-	2	2	-

Course Title/Code	STATISTICS – I(MAH111B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the students with the concepts of Measures of Central Tendency, Measures of Dispersion, Skewness, Moments & Kurtosis and Correlation & Regression Analysis.	
Course Outcomes (COs)		Mapping
CO1	Compute measures of central tendency and solve related problems in real world	Skill Development
CO2	Apply measures of dispersion to solve real world problems	Skill Development
CO3	Assess the shape and peakness of data and calculate the various methods of measurements	Skill Development
CO4	Apply correlation and regression techniques to check the dependency in data	Skill Development
CO5	Develop confidence for self education and ability for life long learning	Skill Development
Prerequisites (if any)	N.A	

SECTION A

Measures of Central Tendency: Introduction, types of averages- Mean, Median, Mode, Geometric mean, Harmonic mean, Relationship among averages, Quartile, Percentile

SECTION B

Measures of Dispersion: Introduction, Significance of measuring variations, Range, Quartile deviation, Mean deviation, Standard deviation, Relation between them, Coefficient of variation, Relation between coefficient of variation and standard deviation

SECTION C

Skewness, Moments & Kurtosis: Introduction, Difference between dispersion and skewness, Measures of skewness, Karl Pearson's coefficient of skewness, Bowley's coefficient of skewness, Kelly's coefficient of skewness, Moments, Moments about arbitrary origin, about zero, about mean, Measures of Kurtosis.

SECTION D

Correlation & Regression Analysis: Introduction, Types of correlation, Karl Pearson's coefficient of correlation, Probable error, Rank correlation, Spearman's correlation coefficient, Concurrent deviation method, Introduction to regression analysis, Difference between correlation and regression analysis, Regression lines and Regression equations.

Textbooks

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.
2. S.C. Gupta, Fundamentals of Statistics, Himalaya Publishing House.
3. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.

Reference Books

1. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

2. S. P. Gupta, Statistical Methods, Sultan Chand & Sons, Educational publishers, New Delhi

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>P O1</u>	<u>P O2</u>	<u>P O3</u>	<u>P O4</u>	<u>P O5</u>	<u>P O6</u>	<u>P O7</u>	<u>P O8</u>	<u>P O9</u>	<u>PO 10</u>	<u>PO 11</u>	<u>PO 12</u>	<u>PO 13</u>
MAH111B	STATISTICS – I	<u>CO1</u>	3	2	3	3	1	-	2	-	2	2	2	-	2
		<u>CO2</u>	3	2	3	3	1	-	2	-	2	2	2	-	2
		<u>CO3</u>	3	2	3	3	1	-	2	-	2	2	2	-	2
		<u>CO4</u>	3	2	3	3	1	-	2	-	2	2	2	-	2
		<u>CO5</u>	-	-	-	-	2	-	2	-	2	2	2	-	2

Course Title/Code	Programming for Problem Solving Using C(CSH105B-T)	
Course Type	Core (Allied)	
L-T-P Structure	2-1-0	
Credits	3	
Course Objective	Students are able to construct a program of moderate complexity from a specification	
Course Outcomes (COs)		Mapping
CO1	Analyse and apply Test Driven Development approach to design programs.	Skill Development
CO2	Understand and apply programming language constructs as per given problems	Skill Development
CO3	Understand and apply C programming language constructs on opensource platform	Skill Development
CO4	learn to work in a team using different online platform for program development	Skill Development
Prerequisites (if any)	N.A	

Section-A

Programming and UNIX

Students will learn the basics of programming using Scratch, they will learn to use statements, expressions, conditions, selection, iteration, variables, functions, arrays, threads and events. In addition, they will be introduced to basic UNIX commands under Bash.

Introduction to Programming, test driven development, Scratch: Introduction, statements, expressions, conditions, selection, iteration, variables, functions, arrays. UNIX: Basic commands- pwd, ls, cd, rm, cat, less, mkdir, rmdir; permissions, root. C language: statements, expressions, conditions, selection iteration, variables, functions, arrays.

Section-B

Applying programming constructs

Students will learn how to write programs that satisfy unit tests. The instructor will build the unit tests, demonstrating how to break a problem down into smaller components. In the labs and homework, students will construct programs that satisfy the unit tests. Students become familiar with the constructs of the C programming language.

Moving to C: Data Types, constants, and variables, Statements, Expressions, Conditions, Selection, iteration, Functions and recursion

Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming

Arrays; One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Null terminated strings as array of characters, Standard library string functions

Introduction to Top-down approach of problem solving, Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments .

Section-C

Practical programming:

During the third quarter of the class, students will begin building their own programs by decomposing problems into smaller tasks and writing unit tests that will check to see that the program accurately accomplishes the task using Test Driven Development. They will then write the program that satisfies their own unit tests. Students will learn to apply the constructs of the C programming language to create

programs.

Students will learn to apply these programming techniques: Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions, Break, Continue and Goto, Type Conversion; Enumerations; Macros. Students will be able to use these techniques to develop programs

Section-D

Memory Management and Abstraction

During the final quarter, students will be introduced to dynamic memory allocation and dynamic data structures including: dynamic arrays. They will consolidate their ability to use the C programming techniques they have learned in the earlier sections.

Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays, pointers and structures, dynamic memory allocation,

Software Configuration Management, Modules, CUNIT, GIT, SCRUM, MAKE. Dynamic Memory Allocation.

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>P O1</u>	<u>P O2</u>	<u>P O3</u>	<u>P O4</u>	<u>P O5</u>	<u>P O6</u>	<u>P O7</u>	<u>P O8</u>	<u>P O9</u>	<u>PO 10</u>	<u>PO 11</u>	<u>PO 12</u>	<u>PO 13</u>
CSH10 5B-T	Programming for Problem Solving Using C	<u>CO1</u>	3	2	3	3	2	-	2	-	2	2	2	2	-
		<u>CO2</u>	3	2	3	3	2	-	2	-	2	2	2	2	-
		<u>CO3</u>	3	2	3	3	2	-	2	-	2	2	2	2	-
		<u>CO4</u>	3	2	3	3	2	-	2	-	2	2	2	2	-

	Programming for Problem Solving Using C Lab (CSH105B-P)	
Course Type	Core (Allied)	
L-T-P Structure	0-0-2	
Credits	1	
Course Objective	Students are able to construct a program of moderate complexity from a specification	
Course Outcomes (COs)		Mapping
CO1	Analyse and apply Test Driven Development approach to design programs.	Skill Development
CO2	Understand and apply programming language constructs as per given problems	Skill Development
CO3	Understand and apply C programming language constructs on opensource platform	Skill Development
CO4	learn to work in a team using different online platform for program development	Skill Development
Prerequisites (if any)	N.A	

LIST OF EXPERIMENTS:

1. Scratch : Covering Concepts of
2. Sequential Statements
3. Variables
4. Blocks
5. Unix Commands: pwd, mkdir, cd, ls, less, touch, cp, move, cat, rm, rmdir -r etc.
6. Moving to C Using nano and gcc.
7. Project on Calculator Using Agile Methodology, Nano, Cunit, Git, Scrum , Agile Methodology, Nano, Gcc, Make.
8. Covering Concepts :
 - Statements
 - Functions
 - Arrays
 - Structures
 - Pointers
9. File Handling.

TEXT BOOKS

1. The C Programming Language, Brian Kernighan and Dennis Ritchie.
2. The Unix Programming Environment

REFERENCE BOOKS

1. Pro Git Help Page
2. Eclipse C/C++ Development Guide

e-Resources (websites/Wikipedia pages/webtutorials/online courses, etc.)

1. Eclipse, <https://eclipse.org/users/>
2. Git, <https://git.com>
2. Harvard's CS50, <https://courses.edx.org/courses/HarvardX/CS50x3/2015/info>

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>P O1</u>	<u>P O2</u>	<u>P O3</u>	<u>P O4</u>	<u>P O5</u>	<u>P O6</u>	<u>P O7</u>	<u>P O8</u>	<u>P O9</u>	<u>PO 10</u>	<u>PO 11</u>	<u>PO 12</u>	<u>PO 13</u>
CSH10 5B-P	Programming for Problem Solving Using C Lab	<u>CO1</u>	3	2	3	3	2	-	2	-	2	2	2	2	-
		<u>CO2</u>	3	2	3	3	2	-	2	-	2	2	2	2	-
		<u>CO3</u>	3	2	3	3	2	-	2	-	2	2	2	2	-
		<u>CO4</u>	3	2	3	3	2	-	2	-	2	2	2	2	-

Course Title/Code	MATHS LAB –I (MAH109B)	
Course Type	Core (Departmental)	
L-T-P Structure	0-0-2	
Credits	1	
Course Objective	To introduce students with the mathematical software & its usage to solve mathematical problems. Computation of statistical parameters using software	
	Course Outcomes (COs)	Mapping
CO1	To perform basic mathematical calculations plotting the graphs and matrix operation using Octave	Skill Development
CO2	To evaluate derivative and its application using mathematical Software	Skill Development
CO3	To understand and apply concept of integration to evaluate area and volume using Mathematical software	Skill Development
CO4	To compute the roots of quadratic, cubic & biquadratics equations and transformation of equations	Skill Development
Prerequisites (if any)	N.A	

LAB EXERCISE Using Software: OCTAVE/ MATLAB/ ALTAIR/Excel

1. Introduction to mathematical software and use of some simple e-commands.
2. Define matrices and compute matrix operations.
3. Introduction to graphics: Basic Two-Dimensional Graphs, Labels, Multiple plots on the
4. same axes, Line styles, Markers and color, Axis limits and Subplots.
5. Limit & continuity of function of single variable.
6. Differentiability of function of single variable & Asymptotes of given curves.
7. Curvature of given cartesian curves, parametric and polar curves.
8. Maxima and minima of several variables.
9. Representation of data using graphs and charts. Computation of Measures of Central Tendency – Mean, Median, Mode, quartiles, deciles.
10. Computation of Measures of Dispersion - range, quartile deviation, mean deviation, standard deviation and coefficient of variation. Comparison of various measures of dispersion.
11. Computation of Measures of Skewness, Moments & Kurtosis.
12. Computation of coefficient of correlation & regression and plotting lines of regression.

TEXT BOOKS

1. MATLAB : An Introduction with Applications. Amos Gilat.

REFERENCE BOOKS

1. Essential Matlab for Scientists and Engineers, B.D Hahn

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO 1</u>	<u>PO 2</u>	<u>PO 3</u>	<u>PO 4</u>	<u>PO 5</u>	<u>PO 6</u>	<u>PO 7</u>	<u>PO 8</u>	<u>PO 9</u>	<u>PO 10</u>	<u>PO 11</u>	<u>PO 12</u>	<u>PO 13</u>
MAH109B	MATHEMATICS LAB –I	<u>CO1</u>	1	-	-	3	3	-	-	-	-	2	-	-	-
		<u>CO2</u>	1	-	-	3	3	-	-	-	-	2	-	-	-
		<u>CO3</u>	1	-	-	3	3	-	-	-	-	2	-	-	-
		<u>CO4</u>	1	-	-	3	3	-	-	-	-	2	-	-	-

Course Title/Code	COMMUNICATIVE ENGLISH(HLS102)	
Course Type	Core (Allied)	
L-T-P Structure	1-0-2	
Credits	2	
Course Objective	To equip the students with effective communication skills, nuances of technical writing and deal extensively with the requirements of Industry.	
Course Outcomes (COs)		Mapping
CO1	To know about all the words and phrases of English language.	Skill Development
CO2	To build the basic skills of effective communication	Skill Development
CO3	To know about the importance of Listening	Skill Development
CO4	To know about the importance of verbal and non verbal movements.	Skill Development
Prerequisites (if any)	N.A	

Section A

Lexis:

Homonyms, Homophones, Homographs, Words often confused, One word Substitutes, Synonyms and Antonyms, Foreign Words, Phrasal Verbs & Idioms and Phrases

Section B

Oral Communication:

Importance of Speech Sounds, Organs of Speech, Vowel Sounds, Consonant Sounds, IPA Symbols, Phonetic Transcription, Phoneme and Syllables, Intonation, Word Stress, Sentence Stress.

Section C

Presentation Skills:

Body Language and Paralanguage, Gestures and Postures, Kinesics, Proxemics, Importance of Body Language in Presentation, Etiquette of the Telephone Handling and Business Meetings, Professional Presentation, Hearing and Listening, Essentials of Effective Listening, Importance of Effective Listening, Visual Presentation – How to prepare slide presentation.

Section D

Technical Writing-II:

Business Letters, Job Application and Resume Writing, Developing Outlines, Circular, Memos, Blog Writing and Comments on Media.

TEXT BOOKS

1. A Practical Course for Developing Writing Skills in English. J K Gangal: PHI Learning Pvt.
2. A Textbook of English Phonetics for Indian Students. T.Bala Subhrmaniam: Macmillan

REFERENCE BOOKS

1. English Vocabulary in Use. McCarthy: Foundation Books, OUP. Print.English Grammar, Competition and Correspondenc. M.A. Pink and A.C. Thomas: S. Chand and Co. Print.
2. Reading Between the Line: Students Book. MacRae: Foundation Books. CUP, New Delhi.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
HLS 102	COMMUNICATIVE ENGLISH	<u>CO1</u>	2	3	1	-	-	-	-	1	2	3	-	-	-
		<u>CO2</u>	2	3	1	-	-	-	-	1	2	3	-	-	-
		<u>CO3</u>	2	3	1	-	-	-	-	1	2	3	-	-	-
		<u>CO4</u>	2	3	1	-	-	-	-	1	2	3	-	-	-

Course Title/Code	CALCULUS – II (MAH115B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the students with the concepts of reduction formulae, application of single integrals , multiple integrals and vector calculus.	
Course Outcomes (COs)		Mapping
CO1	Explain physical meaning of gradient of a scalar field, curl, and divergence in terms of fluid flow and apply its concepts.	Skill Development
CO2	Understand and apply reduction formulae and calculate length of an arc, area of a curve and volume & surface area of solid of revolution.	Skill Development
CO3	Understand and apply the concept of beta and gamma functions to evaluate integrals.	Skill Development
CO4	Evaluate line integrals, surface integrals and volume integrals and relate Stokes, Divergence and Green's Theorems in other branches of Mathematics.	Skill Development
Prerequisites (if any)	Calculus-I(MAH108B)	

Section A

Applications of Single Integral

Reduction formulae: Derivations and illustrations of reduction formulae. Rectification: Length of arc of curves (cartesian, parametric and polar form). Quadrature: Area enclosed by curves (cartesian, parametric and polar form). Solids of Revolution: Volume and surface area of solids of revolution

Section B

Multiple Integrals

Double and Triple Integral, Evaluation of Double Integral over the region, Evaluation of Double Integral by Changing the Order of Integration, Evaluation of Double & Triple Integral by Changing the Variable. Beta and Gamma Functions, Dirichlet Integral.

Section C

Vector Differentiation

Limit & Continuity of vector functions, differentiation of vector functions, tangent and normal components of vector functions, vector fields and scalar fields, gradient of a scalar field and directional derivative. Divergence and Curl of a vector field and their physical interpretations, Irrotational and Solenoidal fields. Laplacian operator

Section D

Vector Integration

Integration of vector functions Line integral, Integrals independent of path, Surfaces in space, Surface integral, Volume integral, Gauss Divergence theorem, Stoke's theorem and Green's theorem.

TEXTBOOKS

1. Shanti Narayan, P.K. Mittal, Integral Calculus, S. Chand.
2. Shanti Naryan, Vector Calculus, S. Chand.

REFERENCE BOOKS

1. B.S.Grewal ,Higher Engineering Mathematics ,Khanna Publications.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MAH115B	CALCULUS – II	<u>CO1</u>	3	2	3	3	2	-	2	-	2	2	2	1	-
		<u>CO2</u>	3	3	3	3	2	-	2	-	2	2	2	1	-
		<u>CO3</u>	3	3	3	3	2	-	2	-	2	2	2	2	-
		<u>CO4</u>	3	2	3	3	2	-	2	-	2	2	2	2	-

Course Title/Code	ALGEBRA (MAH107B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the students with the concepts of set theory, congruences, theory of equations & matrices.	
Course Outcomes (COs)		Mapping
CO1	Understand and apply the basic concepts of sets, relations, functions, mathematical induction and division algorithm.	Skill Development
CO2	Understand and apply the concepts of congruence in the study of algebraic structures.	Skill Development
CO3	Find the solution and transformation of polynomial equations .	Skill Development
CO4	Understand and apply the concepts hyperbolic functions, direct and inverse circular functions and Gregory series to further applications.	Skill Development
Prerequisites (if any)	N.A	

Section A

Sets, Relations & Functions: Sets, Relations, Equivalence relations, Functions, [Direct & Inverse Circular and Hyperbolic Functions, unit-step function, Dirac-Delta function] Composition of functions, Bijective functions, Invertible functions, Principle of mathematical induction, Well-ordering property of positive integers, Division algorithm, Greatest Common Divisor and Least Common Multiple, Statement of fundamental theorem of arithmetic.

Section B

Congruences: Congruences and their properties, Linear congruences and their solutions, Chinese Remainder Theorem, Fermat's Theorem and Wilson's Theorem, Diophantine equation $ax+by=c$ (a, b, c are integers).

Section C

Algebraic Equations: Fundamental Theorem of Algebra, General properties of equations, Descartes rule of sign, Relation between coefficient and roots of the equation, Cube roots of unity. Transformation of equations: Roots with sign changed, Roots multiplied with given quantities, Reciprocal roots, Increase or diminish the root by given quantity, Binomial coefficient,.

Section D

Matrices and its Applications: Elementary Transformations, Elementary Matrices, Inverse using Elementary Transformations, Rank of a matrix, Normal form of a matrix, Linear Dependence and Independence of vectors, Consistency of Linear System of Equations, Linear Transformation, Orthogonal Transformation, Eigen Values and Eigen Vectors, Properties of Eigen Values, Cayley Hamilton theorem, Diagonalization.

TEXTBOOKS

1. Chandrika Prasad:-Text Book on Algebra and Theory of equation, Pothishala Pvt Ltd, 1978.
2. C. C. MacDuffee: Theory of Equations, John Wiley & Sons Inc., 1954

REFERENCE BOOKS

1. W.S. Burnside and A.W. Panton: The Theory of Equations, Dublin University Press, 1954.
2. K.Prakash, O.P Chug & P.Gupta: Algebra and Trigonometry, University Science press, 2009.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MAH107B	ALGEBRA	<u>CO1</u>	3	3	3	3	1	-	2	-	2	-	1	-	-
		<u>CO2</u>	3	3	3	3	2	-	2	-	2	-	-	-	-
		<u>CO3</u>	3	3	3	3	2	-	2	-	2	-	1	-	-
		<u>CO4</u>	3	3	1	3	1	-	2	-	2	-	-	-	-

Course Title/Code	ORDINARY DIFFERENTIAL EQUATIONS (MAH112B)	
Course Type	Core(Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the students with the concepts of Ordinary differential equations and it's applications.	
Course Outcomes (COs)		Mapping
CO1	Describe the concepts of ordinary differential equations and different types ODEs.	Skill Development
CO2	Effectively write mathematical derivation/ solutions of all types of ODEs in a clear and concise manner	Skill Development
CO3	Explain and apply various forms of Ordinary differential equations in the different areas of day to day life problems and solve them.	Skill Development
CO4	Derive and apply the concept of method of variation of parameter, simultaneous linear differential equations in arising the physical problems.(Orthogonal trajectories, electric circuits, etc.)	Entrepreneurs hip
Prerequisites (if any)	N.A	

Section A

Basic concepts and genesis of ordinary differential equations, Formulation, Order and degree of a differential equation, equations of first order and first degree, solutions of equations by separable of variables, homogeneous equations, Linear equations and Bernoulli equations, Exact differential equations, integrating factors, Differential equations of first order but not the first degree.

Section -B

Application of first order differential equations to orthogonal trajectories, simple electric circuits and Newton's law of cooling. Linear differential equations with constant coefficient, Particular integral by inverse operator method of the forms when $X = e^{ax}$, $\sin ax / \cos ax$, x^m , $e^{ax} \cdot V$ and X is any other function and their combination, Method of undetermined coefficients Method of variation of parameters, Euler-Cauchy equation.

Section-C

Liner Equations of second order with variable coefficients, Existence and uniqueness theorem for linear differential equations, Principle of superposition for a homogeneous linear differential equation, Linearly dependent and linearly independent solutions on an interval, Wronskian and its properties, Concept of a general solution of a linear differential equation, Legendre's linear equation, ordinary simultaneous differential equations.

Section-D

Introduction-Definition & Simple situations for Mathematical Modeling, Technique of Mathematical Modeling, Classification of Mathematical Models, Some characteristic of Mathematical Models, compartmental models. Mathematical modeling through ordinary differential equations (Lotka-Volterra pollution model, drug assimilation into the blood of a single cold pill, growth and decay model).

TEXTBOOKS

1. Belinda Barnes and Glenn R. Fulford: Mathematical Modeling with Case Studies, A Differential Equation Approach Using Maple, Taylor and Francis, London and New York, 2002.
3. C. H. Edwards and D. E. Penny: Differential Equations and Boundary Value Problems: Computing and Modeling, Pearson Education, India, 2005.
4. S. L. Ross: Differential Equations, John Wiley and Sons, India, 2004.

REFERENCE BOOKS

- 1.M.D. Rai Singhania: Advanced differential equations.
- 2.J.N.Kapoor:MathematicalModeling.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MAH112B	ORDINARY DIFFERENTIAL EQUATIONS	<u>CO1</u>	3	2	3	3	2	-	2	-	2	2	2	2	-
		<u>CO2</u>	2	1	1	2	2	-	2	-	2	2	2	2	-
		<u>CO3</u>	3	3	2	1	2	-	2	-	2	2	2	2	-
		<u>CO4</u>	3	3	3	1	3	-	2	-	2	3	2	2	-

Course Title/Code	STATISTICS – II (MAH205B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the students with the concepts of Random Variable, Probability Distributions & Mathematical Expectation, Theoretical Distributions, Tests of Hypothesis, Chi square Test F-test, Analysis of Variance.	
Course Outcomes (COs)		Mapping
CO1	Describe the concepts of ordinary differential equations and different types ODEs.	Skill Development
CO2	Effectively write mathematical derivation/ solutions of all types of ODEs in a clear and concise manner	Skill Development
CO3	Explain and apply various forms of Ordinary differential equations in the different areas of day to day life problems and solve them.	Skill Development
CO4	Derive and apply the concept of method of variation of parameter, simultaneous linear differential equations in arising the physical problems.(Orthogonal trajectories, electric circuits, etc.)	Skill Development
Prerequisites (if any)	STATISTICS – I (MAH111B)	

Section A

Random Variable, Probability Distributions & Mathematical Expectation: Random variable, probability distribution of a discrete & continuous random variable, cumulative probability function, moments, Mathematical expectation, Theorems on mathematical expectation, variance of X in terms of expectation, covariance of X in terms of expectation, joint and marginal distributions.

Section B

Theoretical Distributions: Discrete distributions: Uniform, Bernoulli, Binomial, Negative binomial, Geometric and Poisson; Continuous distributions: Uniform, Gamma, Exponential, Chi-square, Beta and normal; Normal approximation to the binomial distribution.

Section C

Tests of Hypothesis: Procedure of testing hypothesis, Two-tailed and one-tailed test of hypothesis, Test of significance for large samples- single proportions, difference of proportions, single mean, difference of mean, test of significance of small sampling, t-test of significance of-mean of a random sample and difference of means of two samples.

Section D

Chi-square Test, F-test, Analysis of Variance: Degree of freedom, Chi-square distribution, Constants of chi square distributions, Conditions for applying Chi square test, Uses of chi square test, F-test, Applications of F-test, Analysis of variance-assumptions & techniques.

TEXT BOOKS

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.
2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.

REFERENCE BOOKS

1. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
2. S. P. Gupta, Statistical Methods, Sultan Chand & Sons, Educational publishers, New Delhi
3. S.C. Gupta, Fundamentals of Statistics, Himalaya Publishing House.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MAH205B	STATISTICS – II	<u>CO1</u>	2	2	2	3	2	1	-	2	1	1	1	1	-
		<u>CO2</u>	2	2	2	3	2	1	-	2	1	1	1	1	-
		<u>CO3</u>	2	2	2	3	2	2	-	2	1	1	1	1	-
		<u>CO4</u>	3	2	3	3	3	3	-	3	3	2	2	2	1

Course Title/Code	MATHS LAB –II(MAH114B)	
Course Type	Core (Departmental)	
L-T-P Structure	0-0-2	
Credits	1	
Course Objective	To familiarize students with programming and computation of integral calculus problems using mathematical software.	
Course Outcomes (COs)		Mapping
CO1	To construct the programming codes for solving mathematical problems.	Skill Development
CO2	To analyze the statistical data by plotting the graph, pi-chart etc.	Skill Development
CO3	To analyze the statistical data in terms of measure of central tendency, dispersion, skewness , kurtosis and corelation regression.	Skill Development
Prerequisites (if any)	MATHS LAB – I(MAH109B)	

LAB EXERCISE: Using Software OCTAVE/ MATLAB/ SCILAB/ALTAIR/Excel/R/SPSS

1. Introduction to programming.- Creating script file or m-files.
2. Introduction to Conditional statements –if and else using mathematical software.
3. Introduction to iteration based programming – for loop, while loop.
4. Introduction to switch and break statements.
5. Introduction to functions and function files.
6. Transformation of an equation.
7. Roots of cubic and bi-quadratic equations.
8. Application of integrals- Compute arc length of a given curve & area under a given curve.
9. Application of integrals- Compute Volume & Surface Area, solid of revolution.
10. Compute Multiple integrals & Special Integrals - Beta –Gamma Functions.
11. Plotting of 2D figures.
12. Plotting of 3D figures.

TEXTBOOKS

1. MATLAB : An Introduction with Applications. Amos Gilat.

REFERENCE BOOKS

1. Essential Matlab for Scientists and Engineers, B.D Hahn

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MAH114B	MATHS LAB –II	<u>CO1</u>	1	-	-	3	3	-	-	-	-	2	-	-	-
		<u>CO2</u>	1	-	-	3	3	-	-	-	-	2	-	-	-
		<u>CO3</u>	1	-	-	3	3	-	-	-	-	2	-	-	-

Course Title/Code	ENVIRONMENTAL SCIENCE (CHH137)	
Course Type	Core (Allied)	
L-T-P Structure	2-0-2	
Credits	3	
Course Objective	To make the student identify the areas of environmental degradation, identify the impact of environmental degradation on the surroundings, apply the concept of sustainable development in real life and correlate his/her field with various aspects of environment	
Course Outcomes (COs)		Mapping
CO1	Explain the multidisciplinary dimension of environmental issues	Skill Development
CO2	Explain the environmental issues and suggest potential solutions	Skill Development
CO3	Discuss about the various types of organisms and draw inferences about their interactions in different	Skill Development
CO4	Defend the principles governing the interactions between social and environmental factors	Skill Development
CO5	environmental settings Organize or create an environmental awareness event/article/campaign/eco-friendly product	Skill Development
Prerequisites (if any)	N.A	

Section A

Multidisciplinary nature of environmental studies

Definition, scope and importance; Need for public awareness.

Renewable and non-renewable resources :

Natural resources and associated problems.

- a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- e) Energy resources : Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
- f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- g) Role of an individual in conservation of natural resources.
- h) Equitable use of resources for sustainable lifestyles.

Section B

Ecosystems

- Concept of an ecosystem
- Structure and function of an ecosystem

- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:
 - a. Forest ecosystem
 - b. Grassland ecosystem
 - c. Desert ecosystem
 - d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation

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

Section C

Environmental Pollution

- Definition, Cause, effects and control measures of :-
 - a. Air pollution
 - b. Water pollution
 - c. Soil pollution
 - d. Marine pollution
 - e. Noise pollution
 - f. Thermal pollution
 - g. Nuclear hazards
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies
- Wasteland reclamation

- Consumerism and waste products
- Environment Protection Act
- Air (Prevention and Control of Pollution) Act
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness.

Section D

Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme
- Environment and human health
- Human Rights
- Value Education
- HIV/AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and human health.
- Case Studies.

ENVIRONMENTAL SCIENCES–FIELD WORK

- Visit to a local area to document environmental assets- river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

TEXTBOOKS

1. K.C. Agarwal, Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.
3. R.C. Brunner, Hazardous Waste Incineration, McGraw Hill Inc.1989.
4. R. S. Clark, Marine Pollution, Clarendon Press Oxford (TB)
5. W. P. Cunningham, T. H. Cooper, E. Gorhani, M. T. Hepworth, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 2001.

REFERENCE BOOKS

1. A. K. De, Environmental Chemistry, Wiley Eastern Ltd.
2. C. Baird and M. Cann, Environmental Chemistry, W.H. Freeman and Company, New York, 2012.
3. C.J-Gonzalez and D.J.C. Constable, Green Chemistry and engineering: A practical Design Approach A John Wiley & Sons, INC., publication, New Jersey, 2011
4. S. E. Manahan, Environmental Chemistry, CRC Press, 2005
5. Perspectives in Environmental Studies Kaushik & Kaushik New age international publishers Ltd.-New Delhi

6. John Grant, The Green marketing Manifesto, Wiley Publication

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
CHH137	Environmental Science	<u>CO1</u>	-	2	-	-	-	-	-	-	2	2	-	-	-
		<u>CO2</u>	-	2	-	-	-	-	-	-	2	2	-	-	-
		<u>CO3</u>	-	2	-	-	-	-	-	-	2	2	-	-	-
		<u>CO4</u>	-	2	-	-	-	-	-	-	2	2	-	-	-
		<u>CO5</u>	-	2	-	-	-	-	-	-	2	2	-	-	-

MAU01 – 3rd SEMESTER

Course Title/Code	REAL ANALYSIS (MAH204B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the students with the concepts of real numbers, sequences and series of real numbers.	
	Course Outcomes (COs)	Mapping
CO1	To apply the field, order and completeness properties over the set of real numbers and its subsets.	Skill Development
CO2	To apply the properties of open and closed sets to analyze various subsets of \mathbb{R} .	Skill Development
CO3	To test the convergence of a real sequence.	Skill Development
CO4	To test the convergence/divergence behavior of an infinite series.	Skill Development
CO5	To test the uniform convergence of sequence of functions and infinite series.	Skill Development
Prerequisites (if any)	N.A	

Section A**Real Number System:**

Algebraic and order properties of \mathbb{R} , Absolute value of a real number; Bounded above and bounded below sets, Supremum and infimum of a nonempty subset of \mathbb{R} , The completeness property of \mathbb{R} , Archimedean property, Density of rational numbers in \mathbb{R} , Definition and types of intervals, Nested intervals property; Neighborhood of a point in \mathbb{R} , Open, closed and perfect sets in \mathbb{R} , Connected subsets of \mathbb{R} , Cantor set and Cantor function.

Section B**Sequences of Real Numbers:**

Sequences, bounded sequence, limit of a sequence, convergent sequences, limit theorems, monotone sequences, monotone convergence theorem, subsequences, convergence and divergence criteria, existence of monotonic subsequences (idea only), Bolzano-Weierstrass theorem for sequences and sets, definition of Cauchy sequence, Cauchy's convergence criterion, limit superior and limit inferior of a sequence.

Section C**Infinite series:**

Definition of infinite series, sequence of partial sums, Convergence and divergence of infinite series of positive real numbers, Necessary condition for convergence, Cauchy criterion for convergence; Tests for convergence of positive term series; Basic comparison

test, Limit comparison test, D'Alembert's ratio test, Cauchy's nth root test, Integral test; Alternating series, Leibniz test, Absolute and conditional convergence.

Section D

Uniform Convergence:

Pointwise and uniform convergence of sequence and series of functions, Weierstrass's M- test, Dirichlet test and Abel's test for uniform convergence, Uniform convergence and continuity, Uniform convergence and differentiability

TEXTBOOKS

1. S.C. Malik and Savita Arora, Mathematical Analysis, New Age Publisher .
2. P.K. Jain ,SK Kaushik, Introduction to Real Analysis, S. Chand.

REFERENCE BOOKS

1. W. Rudin - Principles of Mathematical Analysis - Mc. Graw Hill IntEdition (3rd)
2. Robert G. Bartle and Donald R. Shebert- Introduction to Real Analysis - Wiley India, 3rd ed.
3. Sterling K. Berberian - A First course in Real Analysis -1994 , Springer Verlag, Ny .I nc.
4. S.C. Malik, Principle of Real Analysis, PHI .

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO 1</u>	<u>PO 2</u>	<u>PO 3</u>	<u>PO 4</u>	<u>PO 5</u>	<u>PO 6</u>	<u>PO 7</u>	<u>PO 8</u>	<u>PO 9</u>	<u>PO1 0</u>	<u>PO1 1</u>	<u>PO1 2</u>	<u>PO1 3</u>
<u>MAH204B</u>	<u>REAL ANALYSIS</u>	<u>CO1</u>	3	3	3	3	1	-	2	-	1	1	1	-	-
		<u>CO2</u>	3	3	3	3	1	-	2	-	1	1	1	-	-
		<u>CO3</u>	3	3	3	3	2	-	2	-	2	1	1	-	-
		<u>CO4</u>	3	3	3	3	1	-	2	-	2	1	1	-	-
		<u>CO5</u>	3	3	3	3	2	-	2	-	1	1	-	-	-

Course Title/Code	STATISTICS – II (MAH205B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the students with the concepts of Random Variable, Probability Distributions & Mathematical Expectation, Theoretical Distributions, Tests of Hypothesis, Chi square Test F-test, Analysis of Variance.	
Course Outcomes (COs)		Mapping
CO1	Describe the concepts of ordinary differential equations and different types ODEs.	Skill Development
CO2	Effectively write mathematical derivation/ solutions of all types of ODEs in a clear and concise manner	Skill Development
CO3	Explain and apply various forms of Ordinary differential equations in the different areas of day to day life problems and solve them.	Skill Development
CO4	Derive and apply the concept of method of variation of parameter, simultaneous linear differential equations in arising the physical problems.(Orthogonal trajectories, electric circuits, etc.)	Skill Development
Prerequisites (if any)	STATISTICS – I (MAH111B)	

Section A

Random Variable, Probability Distributions & Mathematical Expectation: Random variable, probability distribution of a discrete & continuous random variable, cumulative probability function, moments, Mathematical expectation, Theorems on mathematical expectation, variance of X in terms of expectation, covariance of X in terms of expectation, joint and marginal distributions.

Section B

Theoretical Distributions: Discrete distributions: Uniform, Bernoulli, Binomial, Negative binomial, Geometric and Poisson; Continuous distributions: Uniform, Gamma, Exponential, Chi-square, Beta and normal; Normal approximation to the binomial distribution.

Section C

Tests of Hypothesis: Procedure of testing hypothesis, Two-tailed and one-tailed test of hypothesis, Test of significance for large samples- single proportions, difference of proportions, single mean, difference of mean, test of significance of small sampling, t-test of significance of-mean of a random sample and difference of means of two samples.

Section D

Chi-square Test, F-test, Analysis of Variance: Degree of freedom, Chi-square distribution, Constants of chi square distributions, Conditions for applying Chi square test, Uses of chi square test, F-test, Applications of F-test, Analysis of variance-assumptions & techniques.

TEXT BOOKS

- Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.
- Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with

Applications, (7th Edn.), Pearson Education, Asia.

REFERENCE BOOKS

4. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
5. S. P. Gupta, Statistical Methods, Sultan Chand & Sons, Educational publishers, New Delhi
6. S.C. Gupta, Fundamentals of Statistics, Himalaya Publishing House.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO 1</u>	<u>PO 2</u>	<u>PO 3</u>	<u>PO 4</u>	<u>PO 5</u>	<u>PO 6</u>	<u>PO 7</u>	<u>PO 8</u>	<u>PO 9</u>	<u>PO1 0</u>	<u>PO1 1</u>	<u>PO1 2</u>	<u>PO1 3</u>
MAH205B	STATISTICS – II	<u>CO1</u>	2	2	2	3	2	1	-	2	1	1	1	1	-
		<u>CO2</u>	2	2	2	3	2	1	-	2	1	1	1	1	-
		<u>CO3</u>	2	2	2	3	2	2	-	2	1	1	1	1	-
		<u>CO4</u>	3	2	3	3	3	3	-	3	3	2	2	2	1

Course Title/Code	GROUP THEORY(MAH206B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the students with the concepts of groups and their properties.	
Course Outcomes (COs)		Mapping
CO1	Recognize the mathematical objects called groups and link the fundamental concepts of groups and symmetries of geometrical objects.	Skill Development
CO2	Explain the significance of the notions of cosets, normal subgroups, and factor groups and analyze consequences of Lagrange's theorem.	Skill Development
CO3	Illustrate Permutation group and their applications	Skill Development
CO4	Classify structure preserving maps between groups and their consequences.	Skill Development
CO5	Understand the basic concepts of group actions and their applications	Skill Development
Prerequisites (if any)	N.A	

Section – A

Groups and its Elementary Properties: Symmetries of a square, Definition and examples of groups including dihedral, permutation and quaternion groups, Elementary properties of groups, Subgroups and examples of subgroups, Lagrange's theorem, Euler phi function, Euler's theorem, Fermat's little theorem.

Section – B

Cyclic & Normal Subgroups: Cyclic groups, Properties of cyclic groups, Properties of cosets, Normal subgroups, Simple groups, Factor groups, Cauchy's theorem for finite abelian groups; Centralizer, Normalizer, Center of a group, Product of two subgroups; Classification of subgroups of cyclic groups.

Section – C

Permutation Groups & Group Homomorphisms: Cycle notation for permutations, Properties of permutations, Even and odd permutations, alternating groups, Cayley's theorem and its applications. Group homomorphisms, Properties of homomorphisms, Group isomorphisms, Properties of isomorphisms; First, second and third isomorphism theorems for groups.

Section – D

Group Actions: Group actions, Orbits and stabilizers, Conjugacy classes, Orbit-stabilizer theorem, Normalizer of an element of a group, Center of a group, Class equation of a group, Inner and outer automorphisms of a group.

TEXTBOOKS

1. Michael Artin (2014). Algebra (2nd edition). Pearson.
2. John B. Fraleigh (2007). A First Course in Abstract Algebra (7th edition). Pearson.
3. Joseph A. Gallian (2017). Contemporary Abstract Algebra (9th edition). Cengage.
4. N. Herstein (2006). Topics in Algebra (2nd edition). Wiley India.

REFERENCE BOOKS

1. Nathan Jacobson (2009). Basic Algebra I (2nd edition). Dover Publications.
2. Ramji Lal (2017). Algebra 1: Groups, Rings, Fields and Arithmetic. Springer.
3. I.S. Luthar & I.B.S. Passi (2013). Algebra: Volume 1: Groups. Narosa.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MAH206B	GROUP THEORY	<u>CO1</u>	3	2	3	1	1	-	3	-	3	2	2	2	
		<u>CO2</u>	3	2	3	1	1	-	3	-	3	2	2	2	
		<u>CO3</u>	3	2	3	1	1	-	3	-	3	2	2	2	
		<u>CO4</u>	3	2	3	1	1	-	3	-	3	2	2	2	
		<u>CO5</u>	3	2	3	1	1	-	3	-	3	2	2	2	

Course Title/Code	PARTIAL DIFFERENTIAL EQUATIONS (MAH207B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the students with the concepts of partial differential equations and mathematical modeling.	
	Course Outcomes (COs)	Mapping
CO1	To understand the concepts of Partial differential equations ,order and degree of PDEs	Skill Development
CO2	To explain various forms/types of Partial differential equations and their solutions	Skill Development
CO3	To apply various tools of Partial differential equations in various engineering problems and solve the problems	Skill Development
CO4	To define and apply the concept of method of separation of variable in arising the physical problems(heat and vibration of strings).	Skill Development
Prerequisites (if any)	ORDINARY DIFFERENTIAL EQUATIONS (MAH112B)	

Section-A

First Order Partial Differential Equation: Introduction, classification, construction and geometrical interpretation of first order partial differential equations (PDE), Lagrange's method of solution of first order Linear PDE, Solution of Nonlinear First Order PDE : Charpit's Method, Standard Forms-I, II, III and IV.

Section-B

Boundary Value Problems: Introduction , Method of separation of variables for PDE, Vibrating string Problem -Wave Equation (one and two dimension), Existence and uniqueness of solution of Vibrating string Problem., Heat conduction problem(one and two dimension), existence and uniqueness of solution of heat conduction problem.

Section-C

Linear Partial Differential Equations with Constant Coefficients: Linear PDE with Constant Coefficients, Solution of Linear Homogeneous PDE with Constant Coefficients : Method of finding the Complementary Function (C.F.) and Particular Integral (P.I.)- Method -I ,II and general method . Solution of Non-Homogeneous Linear PDE with Constant Coefficients: Method of finding the Complementary Function (C.F.) and Particular Integral (P.I.). Equations Reducible to Linear PDE with Constant Coefficients.

Section-D

Second Order Partial Differential Equation with Variable Coefficients: Introduction, Type-I, Type-II, Type-III, and Type-IV. Reduction of PDE to Canonical form by using methods (Parabolic to Canonical, Hyperbolic to Canonical and Elliptic to Canonical form).

TEXTBOOKS

1. TynMyint-U and Lokenath Debnath, Linear Partial Differential Equation for Scientists

- and Engineers, Springer, Indian reprint, 2006.
- Ioannis P Stavroulakis and Stepan A Tersian, Partial Differential Equations: An Introduction with Mathematica and MAPLE, World Scientific, Second Edition 2004.
 - I. N Sneddon, Elements of Partial Differential Equations, Dover Publications

REFERENCE BOOKS

- M.D. RaiSinghania : Advanced differential equations
- N.M. Kapur, a Text book of Differential Equations, Pitambar Publishing Company.

e-Resources (websites/Wikipedia pages/webtutorials/online courses, etc.)

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
<u>MAH207B</u>	<u>PAR TIAL DIFFERENTIAL EQUATIONS</u>	<u>CO1</u>	3	2	3	3	2	-	2	-	3	2	3	3	2
		<u>CO2</u>	3	2	3	3	2	-	2	-	3	2	3	3	2
		<u>CO3</u>	3	2	3	3	2	-	2	-	3	2	3	3	2
		<u>CO4</u>	3	2	3	3	2	-	2	-	3	2	3	3	

Course Title/Code	MATHS LAB-III (MAH208B)	
Course Type	Core (Departmental)	
L-T-P Structure	0-0-2	
Credits	1	
Course Objective	To equip the student with the skill to write scientific or academic document in LaTeX	
Course Outcomes (COs)		Mapping
CO1	Install LaTeX and its related components on a home/personal computer.	Skill Development
CO2	Use LaTeX and various templates acquired from the course to compose Mathematical documents, presentations, and reports.	Skill Development
CO3	Create mathematical documents containing mathematical expressions & formulas via LaTeX.	Skill Development
CO4	Compose articles in different journal styles.	Skill Development
CO5	Insert graphs and figures in LaTeX. Customize LaTeX documents.	Skill Development
Prerequisites (if any)	NA	

LAB EXERCISE:

1. Introduction and basics of LaTeX.
2. Document structure and text formatting in LaTeX.
3. Mechanics of error and warning, lengths, Counters and Boxes.
4. Fundamentals for creating Technical Texts.
5. To Create Special Pages: Indexing ,Glossary, Bibliography
6. To Create Special Documents: Letters, Presentations, Curriculum Vitae.
7. Creating Graphics in LaTeX.
8. Programming: Macros, Plain text, Creating Packages, Themes.
9. Miscellaneous : Modular Documents, Collaborative Writing of LaTeX Documents, Export to other Formats.
10. Math – Type in Microsoft Word.

TEXTBOOKS

1. Dilip Datta, LaTeX in 24 Hours: A Practical Guide for Scientific Writing, Springer

REFERENCE BOOKS

2. Dilip Datta, LaTeX in 24 Hours: A Practical Guide for Scientific Writing, Springer

e-Resources (websites/Wikipedia pages/webtutorials/online courses, etc.)

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>	
<u>MA H208B</u>	<u>MA TH LAB III</u>	<u>CO1</u>	-		-	-	-		-	-	2	-	-	-	-	
		<u>CO2</u>	-	3	-	-	-	2	-	-	-	-	-	-	-	-
		<u>CO3</u>	-	3	-	-	-	2	-	-	-	-	-	-	-	-
		<u>CO4</u>	-	3	-	-	-	2	-	-	-	-	-	-	-	-
		<u>CO5</u>	-	3	-	-	-	2	-	-	-	-	-	-	-	-

Course Title/Code	Mini Project –I (MAN209B)	
L-T-P Structure	1-0-2	
Credits	2	
Course Objective	To develop the research acumen.	
Course Outcomes (COs)		Mapping
CO1	The student shall be able to describe research and its impact.	Skill Development
CO2	The student shall be able to identify broad area of research & analyze the processes and procedures to carry out research.	Skill Development
CO3	The student shall be able to use different tools for literature survey	Skill Development
CO4	The student is able choose specific area/problem of research	Skill Development
CO5	To understand and adopt the ethical practice that is to be followed in the research activities	Skill Development
CO6	To prepare a draft of review/ research article.	Skill Development
Prerequisites (if any)	N.A	

Unit 1: What is Research and its impact?

- 1.1 Capturing the current research trends
- 1.2 Insight about scientific research performed by renowned experts in the related field (casestudies)
- 1.3 Do's and Don'ts pertaining to research

Unit 2: Identification of Broad Area of research

- 2.1 Identification of thrust area of research for deciding broad area
- 2.2 Framing the research questions and hypothesis
- 2.3 Identification of the research gap based on feasibility of problem
- 2.4 Exploration of in-house and commercially available facilities related to broad area

Unit 3: Understanding the tools for Literature Survey

- 3.1 Finding research papers related to a topic
- 3.2 Understanding the different aspects of Literature search
- 3.3 Usage of different sources like Google scholar, WoS, SCI/ SCIE, PubMed, Scopus.
- 3.4 Search for online journals relevant to research area
- 3.5 Indexing of Journals
- 3.5 Usage of scholarly networking sites like Research Gate, Mendeley, and Academia.edu etc.
- 3.6 Demo sessions on the usage of above mentioned sources

Unit 4: Review of research papers pertaining to broad area and specific area of research

- 4.1 Selection of relevant papers
- 4.2 Finding specific research problem from broad area of research
- 4.3 Literature survey and justification of specific research problem
- 4.4 Experimentation and data cleaning and verification
- 4.5 Understanding and selection of the research domain
- 4.6 Seeking information through published work w.r.t the problem
- 4.7 Reading & categorizing the downloaded/referred papers and structuring of the idea
- 4.8 Model design about framing the research questions

Unit 5: Report Writing and Presentation skill Development

- 5.1 Report making on the surveyed literature to cater the basic idea of the research papers
- 5.2 Compiling and analyzing the published results to justify and understand the proposed ideas
- 5.3 Usage of MS-PowerPoint and other technical resources for the presentation
- 5.4 Development of presentation skills and group addressing
- 5.5 Scientific/technical writing and ethical practice, project report

Stages	Time line	Weightage	Conditions
Stage 1	4 weeks (PT1)	25% (25 MARKS)	Students shall be required to provide: 1. Background information of project work. 2. Explanation of objectives. 3. Research plan and methodology.
Stage 2	8Weeks (PT2)	25% (25 MARKS)	Students shall be required to provide: 1. Initial results and further work required to complete the objectives.
Pre-Project report	12 Weeks	On satisfactory recommendation of concerned faculty members students will be allowed for final evaluation (stage 3)	
Stage 3	At the end of semester (PT3)	50% (50 MARKS)	Evaluation will be based on following components: 1. Submission of Project report 2. Viva- Examination (By External Examiner)

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MA N20 9B	Mini Project – I	<u>CO1</u>	-	-	-	-	3	-	-	-	-	-	-	-	-
		<u>CO2</u>	2	-	2	2	3	-	--	-	2	-	2	2	-
		<u>CO3</u>	-	-	-	-	2	3	-	-	-	-	-	-	-
		<u>CO4</u>	2	-	2	2	3	-	-	-	-	-	2	2	-
		<u>CO5</u>	-	-	-	-	-	-	-	-	3	-	2	-	-
		<u>CO6</u>	-	3	-	-	-	-	-	-	-	2	2	2	2

Course Title/Code	APPLIED PHILOSOPHY (EDS288)	
Course Type	Elective (Allied)	
L-T-P Structure	1-0-2	
Credits	2	
Course Objective	To enable students to confront the philosophical problems implicit in the experience of self, others and the society, read critically the philosophy of influential philosophers with respect to society, Science and success in life , understand and apply concepts and theories of moral philosophy , reflect philosophically and ethically on their own personal, professional and civic lives.	
Course Outcomes (COs)		Mapping
CO1	Explore the philosophy of influential philosophers with respect to society, Science and success in life	Skill Development
CO2	Demonstrate the understanding of the concepts and theories of moral philosophy.	Skill Development
CO3	Reflect philosophically and ethically on one's own personal, professional and civic lives.	Skill Development
CO4	Formulate a philosophy of life or world-view consistent with the objectives of liberal society	Skill Development
CO5	Explore the philosophy of influential philosophers with respect to society, Science and success in life	Skill Development
Prerequisites (if any)	N.A	

SECTION A

INTRODUCTION TO PHILOSOPHY: Philosophy: Meaning, Nature and Scope, Practical uses of Philosophy, Branches of Philosophy.

SECTION B

THOUGHTS OF PHILOSOPHERS AND THEIR IMPLICATIONS: General

Philosophy of John Dewey, Swami Vivekananda and Rabindra Nath Tagore, Philosophy of life and success: Steve Jobs, N.R. Narayana Murthi, Dr. A.P.J. Abdul Kalam and Muhammad Yunus, Philosophy of Science and technology- Francis Bacon and Martin Heidegger.

SECTION C

PHILOSOPHICAL PERSPECTIVES OF SOCIO-POLITICAL SCENARIO IN

INDIA: Nature of Democracy and its implications, Meaning and requirements of National Integration, Universal Human Rights

SECTION D

PHILOSOPHICAL PERSPECTIVES OF RELIGIOUS SCENARIO IN INDIA:

Secularism—its nature and implications, Moral Philosophy of religion with special reference to Hinduism, Jainism, Buddhism, Islam, Christianity, Sikhism. Religious pluralism and Religious tolerance.

LAB: (EDS288)

1. Prepare and present a report on ‘philosophy of life’ from the perspective of a young adult.
2. Quiz and interactive sessions on various philosophical perspectives of contemporary philosophers.
3. Organization of and participation in street plays /dramas/ declamation/ debates/ any other suitable activity on any theme of Philosophical perspectives of Socio-Political scenario in India.
4. Group discussions on any suitable topics concerning contemporary society like aggression among youth, Over-ambitiousness in young generation, misuse of democracy, implications of secularism etc. and to reflect upon different viewpoints.
5. Preparation of quotation boards to display quotes of great philosophers in the college premises.
6. Picture interpretation and philosophical reflection on social themes like juvenile crime, begging in India, Social networking etc.
7. Readings from the autobiographies and other publications of great philosophers e.g. ‘Wings of Fire’ followed by discussion session.
8. Showing Videos on Unique personalities: life and philosophies followed by reflection exercises.
9. Any other suitable activity.

TEXTBOOKS

1. Brubacher, John. S. (1969). Modern Philosophies of Education, New Delhi: Tata McGraw-Hill
2. Dewey, J. (1966). Democracy in Education, New York: Macmillan.
3. Ferre, F.(1995). Philosophy of Technology. University of Georgia Press.
4. Gandhi, M. K. (1956). Basic Education. Ahmedabad, Navajivan.
5. Goel, A. & Goel S. L. (2005). Human values and Education. New Delhi: Deep and Deep Publications Pvt. Ltd.

REFERENCE BOOKS

1. Palmer, Joy A. et.al. (2001). Fifty major thinkers on education from confucious to Dewey. New Delhi: Rutledge.
2. Rajput, J.S. (2006). Human Values and Education. New Delhi: Paragon Publications.
3. Walia, J.S. (2011). Philosophical, Sociological and Economic Bases of Education.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
EDS288	APPLIED PHILOSOPHY	<u>CO1</u>	-	-	-	1	-	-	-	3	2	2	-	-	-
		<u>CO2</u>	-	-	-	1	-	-	-	3	1	1	-	-	-
		<u>CO3</u>	-	-	-	1	-	-	-	3	2	2	-	-	-
		<u>CO4</u>	-	-	1	1	-	-	-	2	2	3	-	-	-
		<u>CO5</u>	-	-	-	1	-	-	-	3	2	2	-	-	-

Course Title/Code	Applied Psychology (EDS289)	
Course Type	Elective(Allied)	
L-T-P Structure	1-0-2	
Credits	2	
Course Objective	To define psychology and its application across various fields, understand the conceptual framework of attitude and personality along with cherishing out their attitude and personality development and conceptualize psychology in social and organizational settings.	
Course Outcomes (COs)		Mapping
CO1	To define psychology and its application across various fields.	Skill Development
CO2	To identify major attributes of Personality.	Skill Development
CO3	To conceptualize psychology in social and organizational settings	Skill Development
CO4	To understand group dynamics	Skill Development
CO5	To solve conflicts among the group	Skill Development
Prerequisites (if any)	N.A	

Section A

PSYCHOLOGY: ATTITUDE FORMATION

Psychology: Meaning, nature, and scope, Role of psychology across multi-disciplinary aspects, Introduction: Attitude, Stereotypes, Prejudice, and Discrimination, Formation of attitude and attitude change.

Section B

PERSONALITY AND PERSONALITY DEVELOPMENT

Definition of personality and personality development, State/ Trait approach to personality, Bandura's Social-Cognitive theory of personality

Section C

SOCIAL PSYCHOLOGY

Introduction to social identity, social cognition, and social influence, social conflicts and its resolutions, Group dynamics: Introduction, formation, types of groups, cooperation, competition, and conflict in groups

Section D

ORGANIZATIONAL PSYCHOLOGY

Organizational Psychology: Definition, fundamental concepts and importance, Introduction to job satisfaction, work motivation, and organizational commitment. Introduction to participation, empowerment, and team work

LAB: (EDS289)

1. Prepare a story using different pictures in order to understand the personality
2. Prepare a SWOT Chart to identify strength and weakness of oneself
3. Role of psychology be proved as an asset in professional development
4. Give a brief account of your personality before and after the transaction of course content.
5. Identify different stereotype present in our Society and present your views on it.
6. Collect any five articles on discrimination prevalent in Society

7. List out Company incentives provided to their employee for work motivation.
8. Prepare a street play on social issues to understand the group dynamics
9. Reflection activities to understand the emotions and personality
10. List out the Do's and Don'ts of the Interview
11. Role of body language in attitude formation.
12. Situational Activities: Suppose you are captain of your football team. Draw out inputs to motivate your team, and maintain the team- spirit.
13. Write a brief note on any one attitude you want to change in yourself and the strategies to accomplish it.
14. The psychometric tests to be conducted by learners:
15. Sociometry test
16. Personality testing (16PF)
17. Vineland Social Maturity Scale
18. Rorschach inkblot test
19. Thematic Appreciation Test
20. Color personality Test
21. Any other suitable activities.

TEXTBOOKS

1. Arrow, K. J. (1995). Barrier to Conflict Resolution. NY: W. W. Norton.
2. Bandra, A., & Walters, R. H. (1963). Social Learning and Personality Development. New York: Holt, Rinehart, & Winston.
3. Bandra, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice- Hall, Inc.
4. Baron, R. A., Byrne, D. (1997). Social Psychology (8th Ed.). Boston, MA: Allyn & Bacon.
5. Baron, R. A. (2001). Psychology (5th ed.). London: Pearson.
6. Cialdini, R. B. (2001). Influence: Science and Practice (4th Ed.). Boston, MA: Allyn & Bacon.
7. Feldman, R. S. (2008). Essentials of Understanding Psychology. New Delhi: Tata McGraw Hill.

REFERENCE BOOKS

1. Friedkin, N. (1998). A structural theory of social influence. Cambridge: Cambridge University Press.
2. Gage, N. L., & Berliner, D. C. (1992). Educational Psychology (5th Ed.). Boston, MA: Houghton Mifflin Co.
3. Hall, C. S., Lindzey, G. & Campbell, J. B. (2004). Theories of Personality (4th Ed.). New York: Wiley.
4. Hunt, R. R., & Ellis, H. C. (2006). Fundamentals of Cognitive Psychology. New Delhi: Tata McGraw Hill.
5. McDavid, J. M., & Harari, H. (1994). Social Psychology: Individuals, Groups, and Societies. New Delhi: CBS Publishers.
6. Millward, L. (2005). Understanding Occupational and Organizational Psychology. London: Sage Publications.
7. Morgan, C. T., King, R. A., Weisz, J. R., & Schopler, J. (1993). Introduction to Psychology. (7th Ed.). New Delhi: Tata McGraw Hill.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
EDS 289	Applied Psychology	<u>CO1</u>	-	3	-	-	-	-	-	2	2	3	-	-	3
		<u>CO2</u>	-	3	-	-	-	-	1	2	1	3	-	-	3
		<u>CO3</u>	-	3	-	-	-	-	-	3	-	3	-	-	2
		<u>CO4</u>	-	3	-	-	-	-	-	2	1	2	-	-	3
		<u>CO5</u>	-	3	-	-	-	-	-	2	1	2	-	-	3

Course Title/Code	APPLIED SOCIOLOGY (EDS290)	
Course Type	Elective (Allied)	
L-T-P Structure	1-0-2	
Credits	2	
Course Objective	To know and understand about the fundamental concepts of sociology and its applications, develop the analytical skills of students about ways in which social processes affect our everyday lives, understand the impact of various processes of social change and assess their impact on society and understand and analyze the social cultural dynamics that contribute to transformation of Indian reality	
Course Outcomes (COs)		Mapping
CO1	analyze the social cultural dynamics that contribute to transformation of Indian Society	Skill Development
CO2	develop the necessary skills of social processes which affect our everyday lives.	Skill Development
CO3	study and analyse various contemporary issues of society and able to provide solutions of social barrier and benefiting the masses.	Skill Development
CO4	develop basic research skills in the area of sociology and help to find possible solution of specific social barriers of the society	Skill Development
Prerequisites (if any)	N.A	

Section A

Introduction and Applications of Sociology:

- Society, Community, Social Institutions, Social Groups, Introduction to Applied Sociology
- Sociology and Social Processes
- Sociology and Social Change
- Sociology and Social Problems
- Clinical Sociology

Section B

Sociological Processes:

- Social Stratification, Social Mobility and their impact on society
- Socialization, Agents of Socialization, Assessing the effects of Socialization
- Social Movements: Concept, Impact of Environmental Movements in India: Chipko Movement, Narmada Bachao Andolan

Section C

Processes and Issues of Social Change:

- Social Change: Westernization, Urbanization, Privatization, Globalization, Sustainable development Issues in urban development-Population, poverty, unplanned growth and ecological issues
- Conflict management:
 - Intergroup: Causes, Resolutions
 - Organizational Conflict, Conflict Management and Grievance Handling

Section D

Field Survey & Report Writing:

- Need, Meaning of Survey
- Types of Survey
- Steps in Conducting Survey
- Data Collection Methods
- Salient Features of Report Writing

LAB:

1. Showing Videos on the life and philosophies of Famous sociologists and to acquaint the students about their different theories
2. Preparation of quotation board with the help of displaying the pictures and quotes of famous sociologists
3. Choose a theme of your interest- for e.g., crime, technology environmental concerns or any other and look through the Sunday editorials of any national daily of the last 3 months to locate related articles.
4. Role Play: Gender issues in everyday life, students will form small groups and present skits to address this issue creatively; this will be followed by discussions.
5. Students may be given the assignment of taking pro-active role in initiating social change in a local field
6. Visit a shopping mall and observe the interaction between employees and customers/visitors. Identify themes based on your observation and prepare a questionnaire based on this experience.
7. Look at a set of published letters of Gandhi, Nehru, C.F. Andrews and Tagore etc. and identify key social issues that are discussed in the contents of the letters and prepare a report on it.
8. Students will be asked to write a short essay on the pressures they feel of the experience in performing masculinity or femininity, Presentations and discussions based around the essays.
9. Debate or discussion on “Is the family the site of love and care” or “Is the family democratic?”
10. Discuss the impact of modernization, industrialization and globalization on the day- today life.
11. Students may be asked to apply any applied research technique
12. Design a survey on factors effecting marriage choices of young people.
13. Any other suitable activity

TEXTBOOKS

1. Andrew, W. (1997) Introduction to the Sociology of Development. New Jersey, Palgrave Macmillan.

REFERENCE BOOKS

1. Berg, L.B. (2001). Qualitative Research Methods for the Social Sciences (4th edition). Boston: Allyn and Bacon

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
EDS 290	APPLIED SOCIOLOGY	<u>CO1</u>	-	2	-	-	-	-	-	-	-	-	-	-	-
		<u>CO2</u>	-	3	-	-	-	2	-	-	1	-	-	-	-
		<u>CO3</u>	-	-	-	-	-	-	-	3	1	-	-	-	-
		<u>CO4</u>	-	-	-	-	-	2	-	-	-	2	-	-	-

Course Title/Code	Basics of Economics (MCS231)	
Course Type	Elective (Allied)	
L-T-P Structure	2-0-0	
Credits	2	
Course Objective		
	Course Outcomes (COs)	Mapping
CO1	To comprehend the economic problems of the society.	Skill Development
CO2	To enlighten the laws of utility, demand and supply and their measurement.	Skill Development
CO3	To explain the laws of production and various concepts of costs.	Skill Development
CO3	To elaborate the various market forms and the nature and characteristics of Indian economy	Skill Development
Prerequisites (if any)	N.A	

SECTION-A

Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance.

SECTION-B

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, degrees of Price elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand.

SECTION-C

Meaning of production and factors of production, laws of production, various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost and opportunity cost. Shape of short run cost curves.

SECTION-D

Meaning of Market, Types of Market -Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets). Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices.

TEXTBOOKS

1. Principles of Economics: P.N. Chopra (Kalyani Publishers).
2. Economics for Engineers- T R Jain & O P Khanna
3. Micro Economic Theory – M.L. Jhingan (S.Chand).
4. Micro Economic Theory - H.L. Ahuja (S.Chand).

REFERENCE BOOKS

1. Modern Micro Economics: S.K. Mishra (Pragati Publications).
2. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co.).
3. Indian Economy: Rudar Dutt & K.P.M. Sundhram

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MC S231	Basics of Economics	<u>CO1</u>	-	-	1	1	-	-	-	1	1	1	1	1	1
		<u>CO2</u>	-	-	1	2	-	-	-	1	2	1	2	-	1
		<u>CO3</u>	-	-	1	2	-	-	-	1	1	1	1	-	1
		<u>CO4</u>	-	-	1	2	-	-	-	1	2	1	2	-	1

Course Title/Code	QUANTITATIVE APTITUDE - I (CDO203)	
Course Type	Elective (Allied)	
L-T-P Structure	2-0-0	
Credits	2	
Course Objective		
	Course Outcomes (COs)	Mapping
CO1	Students will be able to analyze various forms of data	Skill Development
CO2	Students will be able to solve complex problems based on arithmetic reasoning.	Skill Development
CO3	Students will be able to apply short tricks on complex problems of number system.	Skill Development
Prerequisites (if any)	N.A	

Unit 1: Number System

1.1 Simplification

- 1.1.1 BODMAS rule
- 1.1.2 Fractions and recurring decimals
- 1.1.3 Surds and indices

1.2 Numbers

- 1.2.1 Types of numbers and number tree
- 1.2.2 Divisibility Rule
- 1.2.3 HCF & LCM

Unit 2: Arithmetic I

2.1 Percentages

2.2 Ratio & Proportion

- 2.2.1 Proportionality
- 2.2.2 Variations
- 2.2.3 Partnership

2.3 Profit & Loss

- 2.3.1 Basic terminology & Formulae
- 2.3.2 Error in Weights
- 2.3.3 Marked Price and Discounts

2.4 Average

2.5 Interest

- 2.5.1 Simple Interest
- 2.5.2 Compound Interest
- 2.5.3 Relation between SI & CI

Unit 3: Arithmetic II

3.1 Time & Work

- 3.1.1 Time and Work, Chain Rule
- 3.1.2 Work & Wages
- 3.1.3 Pipes & Cisterns

3.2 Time, Speed & Distance

- 3.2.1 Basics Formulas & Proportionality
- 3.2.2 Average & Relative Speed
- 3.2.3 Trains and Boats & Streams
- 3.2.4 Circular Motion and Clocks

3.3 Alligation & Mixtures

Unit 4: Reasoning Ability

- 4.1 Clocks
- 4.2 Coding Decoding
- 4.3 Arithmetic Reasoning
- 4.4 Blood Relation Test
- 4.5 Direction Sense Test

Instructions for paper setting: Fifty MCQ will be set in total. All questions will be compulsory. Each question will be of 1 mark. There will be no negative marking. Calculator will not be allowed.

TEXTBOOKS

1. Quantitative Aptitude for Competitive Examinations: R S Aggarwal, S Chand & Company Pvt Ltd, Edition 2017

REFERENCE BOOKS

1. A Modern Approach to Verbal & Non Verbal Reasoning: R S Aggarwal, S Chand & Company Pvt Ltd, Edition 2018

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO1</u> ₀	<u>PO1</u> ₁	<u>PO1</u> ₂	<u>PO1</u> ₃
CD O203	QUANTITATIVE APTITUDE - I	<u>CO1</u>	1	2	3	-	-	-	-	-	-	-	-	-	3
		<u>CO2</u>	1	2	3	-	-	-	-	-	-	-	-	-	3
		<u>CO3</u>	1	2	3	-	-	-	-	-	-	-	-	-	3

Course Title/Code	FRENCH-I(FLS103)	
Course Type	Audit (University Compulsory)	
L-T-P Structure	1-1-0	
Credits	2	
Course Objective	Basic knowledge of grammatical structure, syntax, and vocabulary of English and/or Hindi	
Course Outcomes (COs)		Mapping
CO1	Exchange greetings and do introductions using formal and informal expressions. Understand and use interrogative and answer simple questions.	Skill Development
CO2	Learn Basic vocabulary that can be used to discuss everyday life and daily routines, using simple sentences and familiar vocabulary. Express their likes and dislikes.	Skill Development
CO3	Describe themselves, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary.	Skill Development
CO4	Students will be able to understand audio text and comprehend to the same. They will be able to form paragraph using auxiliary verb and basic verbs.	Skill Development
CO5	Students will be introduced to French culture and civilization. They will be able to describe various places and locations of Francophonic countries.	Skill Development
Prerequisites (if any)	N.A	

SECTION-A

Unit - Saluer et épeler l'alphabet

1.1 Les Salutations & forms of politeness

1.2 Alphabets

Unit 2- Usage de Vous et de Tu

2.1 Taking leave expressions

2.2 Les pronoms sujets

2.3 Basic Questions

SECTION-B

Unit 3- Présentez-vous

3.1 Les verbes ER

3.2 Self introduction

3.3 Décrivez votre ami(e)

SECTION-C

Unit 4- Identifier un nombre, compter

4.1 Les noms

4.2 Verbes Avoir, Etre, Aller & Faire

4.3 Les nombres

Unit 5- Demander/ donner l'explications

5.1 Les articles definite et indefini

5.2 Les mois de l'annee

5.3 Les jours de la semaine

SECTION-D

Unit 6- Parler des saisons et demander l'heure

6.1 Time

6.2 Weather

6.3 Unseen Passage

Text Books/Reference Books/ Suggested Readings:

Weblinks:

TEXTBOOKS

- i. 1. Alter Ego Level One Textbook, Annie Berthet, Catherine Hugot, Hachette Publications

REFERENCE BOOKS

- ii. 1. Apprenons Le Francais II & III, Mahitha Ranjit, 2017, Saraswati Publications

e-Resources (websites/Wikipedia pages/webtutorials/online courses, etc.)

1. www.bonjourfrance.com
2. www.allabout.com

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO 1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO 5</u>	<u>PO 6</u>	<u>PO 7</u>	<u>PO 8</u>	<u>PO 9</u>	<u>PO1 0</u>	<u>PO11</u>	<u>PO 12</u>	<u>PO1 3</u>
FLS103	FRE NC H-I	<u>CO1</u>	-	3	-	-	-	-	1	3	2	1	-	-	-
		<u>CO2</u>	1	3	1	-	1	-	1	-	1	-	-	1	-
		<u>CO3</u>	2	3	2	-	2	-	3	-	1	-	-	1	-
		<u>CO4</u>	2	3	-	-	1	-	2	-	-	-	-	1	-
		<u>CO5</u>	1	1	-	-	2	-	1	2	2	-	-	-	-

Course Title/Code	GERMAN-I(FLS102)	
Course Type	Audit (University Compulsory)	
L-T-P Structure	1-1-0	
Credits	2	
Course Objective	Exchange greetings and do introductions using formal and informal expressions, Understand and use interrogative and answer simple questions, Learn Basic vocabulary that can be used to discuss everyday life and daily routines, using simple sentences and familiar vocabulary. Also will have understanding of simple conversations about familiar topics (e.g., greetings, weather and daily activities,) with repetition when needed	
Course Outcomes (COs)		Mapping
CO1	Students will be able to know the living standard of Germany and can learn the comparison with their native country like the types of houses Germans have and the type of houses they have in their country.	Skill Development
CO2	Students will be able to identify belongingness of the objects like what belongs to them or what belongs to someone else.	Skill Development
CO3	Students will be able to describe their daily routine in German language. They will be able to learn timings as well.	Skill Development
CO4	Students will be able to learn informal letter writing like they can mention their daily routine to their friend.	Skill Development
Prerequisites (if any)	N.A	

SECTION-A

Unit-1: Begrüßungen

- 1.1 Salutations/Greetings
- 1.2 Introduction

Unit-2: sich vorstellen und Zahlen

- 2.1 Introduction
- 2.2 Alphabets
- 2.3 Numbers 1-20

SECTION-B

Unit-3: Berufe/ Pronomen

- 3.1 Personal pronouns
- 3.2 Hobbies and professions

SECTION-C

Unit-4: Café

- 4.1 Café related vocabulary and dialogues
- 4.2 Revision personal pronouns

Unit-5: Café dialog

- 5.1 Café related vocabulary and dialogues
- 5.2 Common verbs and their conjugations

SECTION-D

Unit-6: Zeit und Monate

- 6.1 Time
- 6.2 Days
- 6.3 Months

Text Books/Reference Books:

Weblinks:

TEXTBOOKS

- iii. 1. Studio D A1, Hermann Funk, 2011, Cornelson Publication
- iv. 2. Tangaram Aktuell A1, Kursbuch & Arbeitsbuch, 2011, Hueber

REFERENCE BOOKS

- v. 1. Netzwerk, Stefanie Dengler, Paul Rusch et. Al, 2011, Klett

e-Resources (websites/Wikipedia pages/webtutorials/online courses, etc.)

<http://www.nthuleen.com/>

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
FLS 102	GE RM AN-I	<u>CO1</u>	-	3	-	-	-	-	1	3	2	1	-	-	-
		<u>CO2</u>	1	3	1	-	1	-	1	-	1	-	-	1	-
		<u>CO3</u>	1	3	1	-	1	-	1	-	1	-	-	1	-
		<u>CO4</u>	1	1	-	-	2	-	1	2	2	-	-	-	-

MAU01 – 4th SEMESTER

Course Title/Code	ADVANCED ANALYSIS (MAH210B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	The students would be able to apply the concepts of theory of Riemann Integrals, Improper integrals and fundamentals of Complex Analysis required for solving the mathematical problems and their applications.	
Course Outcomes (COs)		Mapping
CO1	Apply the concepts of Riemann Integrals to evaluate definite integrals.	Skill Development
CO2	apply various techniques to evaluate different kinds of Improper integrals.	Skill Development
CO3	Explain different kinds of functions of complex variables and apply them for solving mathematical problems.	Skill Development
CO4	Demonstrate and apply the concept of analytic functions for solving mathematical problems.	Skill Development
Prerequisites (if any)	Real Analysis(MAH204B)	

Section A

Riemann Integral-I: The Upper and lower R-integrals, Integrable (R) functions, Properties of definite and indefinite integral Riemann condition of integrability, Riemann sum, Basic inequality of Riemann integral, algebraic and order properties of the Riemann integral.

Riemann integrability for continuous functions, monotonic functions and functions with finite number of discontinuities.

Section B

Riemann Integral-II: The fundamental theorem of integral calculus, Mean Value Theorem (First and Second), Change of variable of R-integral.

Improper Integrals : Improper integrals, Convergence of improper integrals, tests of convergence for improper integrals, Abel's and Dirichlet's tests for improper integrals, Beta and Gamma functions.

Section C

Function of Complex Variable: Complex number system, function of Complex variable, Elementary functions, Transformations, Limit, Continuity, Differentiability, Analytic function, Cauchy-Riemann equations, Harmonic functions, Milne-Thomson method, L'Hospital's Rule Taylor's and Maclaurin's Series, Singular points.

Section D

L'Hospital's Rule Taylor's and Maclaurin's Series, Singular points. Line integral, Cauchy's theorem, Green's theorem,

Morrera's theorem Cauchy's integral formula, Poles and residue's, Cauchy's residue theorem, Evaluation of integrals using Residue theorem.

TEXTBOOKS

1. W. Rudin- Principles of Mathematical Analysis - Mc. Graw Hill Int .Edition (3rd)
2. C. C. Pugh, Real Mathematical Analysis- Springer Verlag, Ny. Inc.

REFERENCE BOOKS

1. S.C. Malik and Savita Arora, Mathematical Analysis, New Age International (P).
2. J. W. Brown and R. V. Churchill, Complex variable and Application.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO 1</u>	<u>PO 2</u>	<u>PO 3</u>	<u>PO 4</u>	<u>PO 5</u>	<u>PO 6</u>	<u>PO 7</u>	<u>PO 8</u>	<u>PO 9</u>	<u>PO1 0</u>	<u>PO1 1</u>	<u>PO1 2</u>	<u>PO1 3</u>
MAH210B	ADVANCED ANALYSIS	CO1	3	3	3	3	-	1	2	-	2	-	-	-	-
		CO2	3	3	3	3	-	1	2	-	2	-	-	-	-
		CO3	3	3	3	3	-	-	2	-	2	-	-	-	-
		CO4	3	3	3	3	-	-	2	-	2	-	-	-	-

Course Title/Code	ADVANCED ALGEBRA(MAH211B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the students with the concepts of advanced group theory and ring structure with their properties.	
Course Outcomes (COs)		Mapping
CO1	Recognize and apply the Sylow theorems to characterize certain finite groups.	Skill Development
CO2	Understand & Apply the fundamental concepts of ring theory such as the concepts of ideals, quotient rings, integral domains, and fields.	Skill Development
CO3	Learn in detail about Ring homomorphism, polynomial rings and their applications.	Skill Development
CO4	Understand Fundamental properties of finite field extensions and classification of finite fields useful in advanced mathematical theories	Skill Development
Prerequisites (if any)	GROUP THEORY(MAH206B)	

	Sections	Weightage
Syllabus	A	25%
	B	25%
	C	25%
	D	25%
	TOTAL	100%

Section A

Sylow Theorems:Cauchy's theorem for finite abelian groups, Finite simple groups, Sylow theorems and applications including nonsimplicity tests.

Section B

Rings:Definition, examples and elementary properties of rings, Commutative rings, Integral domain, Division rings and fields,

Characteristic of a ring, Ideals and quotient rings. Prime, principal and maximal ideals, Relation between integral domain and field.

Section C

Ring Homomorphism & Polynomial Rings: Homomorphism of rings, Fundamental theorem on Homomorphism of rings. Euclidean rings and their properties, Wilson and Fermat's theorems.

Polynomial rings over commutative ring and their basic properties, The division algorithm; Polynomial rings over rational field, Gauss lemma and Eisenstein's criterion.

Section D

Integral Domains & Fields: Euclidean domain, principal ideal domain, and unique factorization domain. Fields, Extension of a field, Algebraic element of a field, Algebraic and transcendental numbers, Perfect field, Classification of finite fields.

TEXTBOOKS

1. David S. Dummit & Richard M. Foote (2008). Abstract Algebra (2nd edition). Wiley.
2. Joseph A. Gallian (2017). Contemporary Abstract Algebra (9th edition). Cengage.
3. I. N. Herstein (2006). Topics in Algebra (2nd edition). Wiley India.
4. Michael Artin (2014). Algebra (2nd edition). Pearson.

REFERENCE BOOKS

5. P. B. Bhattacharya, S. K. Jain & S. R. Nagpaul (2003). Basic Abstract Algebra (2ndedition). Cambridge University Press.
6. I. S. Luthar & I. B. S. Passi (2013). Algebra: Volume 1: Groups. Narosa.
7. I. S. Luthar & I. B. S. Passi (2012). Algebra: Volume 2: Rings. Narosa.
8. V. K Khanna and S. K Bhambari, A Course In Abstract Algebra, Vikash Publishing

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO1</u> <u>0</u>	<u>PO1</u> <u>1</u>	<u>PO1</u> <u>2</u>	<u>PO1</u> <u>3</u>
<u>MA H21 1B</u>	<u>Advanced Algebra</u>	<u>CO1</u>	3	2	3	-	2	-	2	-	2	-	-	-	-
		<u>CO2</u>	3	2	3	-	2	-	2	-	2	-	-	-	-
		<u>CO3</u>	3	2	3	-	2	-	2	-	2	-	-	-	-
		<u>CO4</u>	3	2	3	-	2	-	2	-	2	-	-	-	-

Course Title/Code	MECHANICS-I(MAH212B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	The students would be able to apply the concepts of Statics required for solving the mathematical problems and their applications.	
Course Outcomes (COs)		Mapping
CO1	Understand the concept and basic terms of Mechanics, Composition and resolution of forces. Parallel forces. Moments and Couples.	Skill Development
CO2	Derive the mathematical solutions of all theorems / formulas of all topics in a clear and concise manner.	Skill Development
CO3	Explain and solve analytical conditions of equilibrium of coplanar forces, Friction, Centre of Mass and Centre of Gravity, Virtual work, Forces in three dimensions and Poinots central axis.	Skill Development
CO4	Determine and apply mathematical equation of Wrenches, Null lines and planes. Stable and unstable equilibrium and solve the problems.	Skill Development
Prerequisites (if any)	N.A	

Section-A

Composition and resolution of forces. Parallel forces. Moments and Couples.

Section-B

Analytical conditions of equilibrium of coplanar forces. Friction. Centre of Mass and Centre of Gravity.

Section-C

Virtual work. Forces in three dimensions. Poinots central axis

Section-D

Wrenches. Null lines and planes. Stable and unstable equilibrium.

TEXTBOOKS

1. S.L. Loney : Statics, Macmillan Company, London

REFERENCE BOOKS

1. R.S. Verma : A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>

MA H21 2B	ME CH ANI CS-I	<u>CO1</u>	3	2	3	3	-	-	2	2	2	2	2	1	2	
		<u>CO2</u>	3	3	3	2	-	-	2	2	1	1	2	2	2	1
		<u>CO3</u>	3	2	2	2	-	-	2	1	1	2	1	2	2	2
		<u>CO4</u>	2	3	1	2	-	-	1	2	1	2	2	2	1	1

Course Title/Code	INTEGRAL TRANSFORMS & APPLICATION(MAH213B)	
Course Type	CORE(DEPARTMENTAL)	
L-T-P Structure	3-1-2	
Credits	4	
Course Objective	To equip the student with notion of Laplace transforms, Fourier transforms and Z-transforms and their applications.	
Course Outcomes (COs)		Mapping
CO1	Calculate the Laplace and Inverse Laplace transforms and apply the same to solve differential and integral equations.	Skill Development
CO2	Find the Fourier series expansion of a function.	Skill Development
CO3	Compute the Fourier and Inverse Fourier transforms and apply the same to solve differential and integral equations.	Skill Development
CO4	Compute Z-Transform and Inverse Z-Transform and apply the same to solve differential and integral equations.	Skill Development
Prerequisites (if any)	N.A	

SECTION A

Laplace Transforms and its Applications: Laplace transforms of elementary functions, Properties of Laplace transforms, Existence conditions, Transforms of derivatives, Transforms of integrals,

Multiplication by t , Division by t . Evaluation of integrals by Laplace transforms. Laplace transform of unit step function, Unit impulse function and periodic function. Inverse transforms, Convolution theorem,

Section B

Application of Laplace Transforms: Application to linear differential equations and simultaneous linear differential equations with constant coefficients and Applications to integral equations.

Fourier Series: Euler's formulae, Conditions for a Fourier expansion, Change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, Rectangular wave, Saw-toothed wave, Half and full rectified wave, Half range sine and cosine series.

Section C

Fourier Transforms : Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function. Application of Fourier transforms in initial and boundary value problem.

Section D

Z-TRANSFORMS: Introduction, Basic Theory of Z-transforms, Z-transforms of various sequences, Existence of Z-transforms, Properties of Z-transforms, Inverse Z-transforms, Differentiation of Z-transforms, Convolution of sequences,

Solution of difference equations using Z-transforms.

INTEGRAL TRANSFORMS & APPLICATION LAB (MAH341-P):

Objective: Mini Project encourage students to explore and strengthen the understanding of subject through practical application of theoretical concepts. It also helps students to boost their skills and widen

their horizon of thinking.

Students are required to identify the topics for project work related with applications of Integral Transforms and Applications. Students can work individually or in a group of 2 & 3. Some suggested topics for mini project are

1. Application of Laplace transforms
2. Application of Fourier Series
3. Application of Fourier transforms
4. Application of Z transforms...etc

TEXTBOOKS

1. Higher Engineering Mathematics: B. S. Grewal

REFERENCE BOOKS

1. Advanced Engineering Mathematics: Jain and Iyenger

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MAH213B	INTEGRAL TRANSFORMS & APPLICATION	<u>CO1</u>	3	3	2	3	1	1	2	-	2	1	1	-	-
		<u>CO2</u>	3	3	2	2	1	2	2	-	2	1	1	-	-
		<u>CO3</u>	3	2	2	3	1	1	2	-	2	1	1	-	-
		<u>CO4</u>	3	1	2	3	1	1	2	-	2	1	1	-	-

Course Title/Code	SET THEORY AND NUMBER THEORY (MAH214B)	
Course Type	Elective(Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the student the concept of set, set operation, cartesian products of sets, cardinality of set, relation, the basic structure and properties of integers.	
Course Outcomes (COs)		Mapping
CO1	Apply the concept of set and relation on pure and applied mathematics.	Skill Development
CO2	Prove results involving divisibility and greatest common divisors	Skill Development
CO3	Find integral solutions to specified linear Diophantine Equations.	Skill Development
CO4	Apply Euler-Fermat's Theorem to prove relations involving prime numbers.	Skill Development
Prerequisites (if any)	N.A	

Section-A

Cartesian products of sets, equivalence relations and partition, fundamental theorem of equivalence relation, equivalent set, countable sets and uncountable sets, cantor's theorem Cardinal numbers, power of continuum, cardinal arithmetic, inequalities in cardinals, Schoeder-Bernstein theorem, partially and totally ordered sets.

Section-B

Linear Diophantine equation, prime counting function, statement of prime number theorem, Goldbach conjecture, linear congruencies, complete set of residues, Algebraic congruencies Chinese Remainder theorem, Fermat's Little theorem, Lagrange theorem, Wilson's theorem.

Section-D

Number theoretic functions, sum and number of divisors, totally multiplicative functions, definition and properties of the Dirichlet product, the Mobius Inversion formula, the greatest integer function, Euler's phi-function, Euler's theorem, reduced set of residues, some properties of Euler's phi-function.

Section-D

Order of an integer modulo n , primitive roots for primes, composite numbers having primitive roots, Euler's criterion, the Legendre symbol and its properties, quadratic reciprocity, quadratic congruencies with composite moduli. Fibonacci Numbers, sequences and Fibonacci Identities, Pell number.

TEXTBOOKS

1. David M. Burton: Elementary Number Theory, 6th Ed., Tata McGraw-Hill, Indian reprint, 2007.

REFERENCE BOOKS

1. U. Dudley: Elementary Number Theory, Dover Publication.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>

MA H21 4B	SET THE OR Y AN D NU MB ER THE OR Y	<u>CO1</u>	3	3	2	3	2	1	2	-	2	1	2	-	-
		<u>CO2</u>	3	3	3	3	2	2	2	-	2	1	2	-	-
		<u>CO3</u>	3	2	3	2	1	1	2	-	2	1	1	-	-
		<u>CO4</u>	3	2	3	2	1	-	2	-	2	1	1	-	-

Course Title/Code	SURVEY SAMPLING AND INDIAN OFFICIAL STATISTICS(MAH216B)	
Course Type	Elective(Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To familiarize students with survey sampling theory, techniques and present official statistical system in India.	
Course Outcomes (COs)		Mapping
CO1	understand the concept of population and sample and estimate statistical attributes of both like mean, variances etc.	Skill Development
CO2	apply Stratified random sampling technique	Skill Development
CO3	apply Ratio and regression methods of estimation	Skill Development
CO4	understand the methods of collection of official statistics and data handling.	Skill Development
Prerequisites (if any)	STATISTICS – I (MAH105B) & STATISTICS – II(MAH202B)	

Section A

Concept of population and sample, complete enumeration versus sampling, sampling and nonsampling errors. Types of sampling: non-probability and probability sampling, basic principle of sample survey, simple random sampling with and without replacement, definition and procedure of selecting a sample, estimates of: population mean, total and proportion, variances of these estimates, estimates of their variances and sample size determination.

Section B

Stratified random sampling: Technique, estimates of population mean and total, variances of these estimates, proportional and optimum allocations and their comparison with SRS. Practical difficulties in allocation, estimation of gain in precision, post stratification and its performance. Systematic Sampling: Technique, estimates of population mean and total, variances of these estimates ($N=n \times k$). Comparison of systematic sampling with SRS and stratified sampling in the presence of linear trend and corrections.

Section C

Introduction to Ratio and regression methods of estimation, first approximation to the population mean and total (for SRS of large size), variances of these estimates and estimates of these variances, variances in terms of correlation coefficient for regression method of estimation and their comparison with SRS. Cluster sampling (equal clusters only) estimation of population mean and its variance, comparison (with and without randomly formed clusters). Relative efficiency of cluster sampling with SRS in terms of intra class correlation. Concept of sub sampling

Section D

Present official statistical system in India, Methods of collection of official statistics, their reliability and limitations. Role of Ministry of Statistics & Program Implementation (MoSPI), Central Statistical Office (CSO), National Sample Survey Office (NSSO), and National Statistical Commission. Government of India's Principal publications containing data on the topics such as population, industry and finance.

TEXTBOOKS

1. Cochran W.G. (1984):Sampling Techniques(3rd Ed.), Wiley Eastern.
2. Sukhatme,P.V., Sukhatme,B.V. Sukhatme,S. Asok,C.(1984). Sampling Theories of Survey With Application, IOWA State University Press and Indian Society of Agricultural Statistics

REFERENCE BOOKS

1. Murthy M.N. (1977): Sampling Theory & Statistical Methods, Statistical Pub. Society, Calcutta.
2. Des Raj and Chandhok P. (1998): Sample Survey Theory, Narosa Publishing House.
3. Goon A.M., Gupta M.K. and Dasgupta B. (2001): Fundamentals of Statistics (Vol.2), World Press.
4. Guide to current Indian Official Statistics, Central Statistical Office, GOI, New Delhi.

e-Resources (websites/Wikipedia pages/webtutorials/online courses, etc.)

1. <http://mospi.nic.in/>

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MAH216B	SURVEY SAMPLING AND INDIAN OFFICIAL STATISTICS	<u>CO1</u>	3	1	2	-	3	-	1	-	3	3	3	2	3
		<u>CO2</u>	3	1	2	-	3	-	1	-	3	3	3	2	3
		<u>CO3</u>	3	1	2	-	3	-	1	-	3	3	3	2	3
		<u>CO4</u>	3	1	2	-	3	-	1	-	3	3	3	2	3

Course Title/Code	Data Structures (CSH210B-T)	
Course Type	Core (Allied)	
L-T-P Structure	3-0-0	
Credits	3	
Course Objective	The course should assess how the choice of data structures and algorithm design methods impacts the performance of programs and choose the appropriate data structure and algorithm design method for a specified application.	
Course Outcomes (COs)		Mapping
CO1	To understand the concept of Dynamic memory management, algorithms and their complexity ; demonstrate the abstract properties and operations of Linear data structures (using Static Memory Allocation) : Array ; To apply different Searching and Sorting algorithms.	Skill Development
CO2	Demonstrate the abstract properties and operations of Linear data structures (using Dynamic Memory Allocation) : Link List and variations of Linked List.	Skill Development
CO3	Demonstrate the abstract properties and operations of Linear data structures (using Static & Dynamic Memory Allocation) : Stacks, Queues	Skill Development
CO4	Demonstrate the abstract properties and operations of Non Linear data structures (using Static & Dynamic Memory Allocation) : Trees, Graphs	Skill Development
Prerequisites (if any)	N.A	

Section-A

Data structures and Algorithms: Introduction to Data structure: Concept of data structure, choice of right data structures, types of data structures, Introduction to algorithms, how to design and develop an algorithm: stepwise refinement, algorithm analysis, complexity of algorithms

Arrays: Introduction, One Dimensional Arrays, two dimensional array, address calculation of a location in arrays operations defined: traversal, selection, searching, insertion, deletion, Searching: linear search, binary search, Sorting: selection sort, bubble sort, insertion sort

Section-B

Pointers: Introduction to pointers, Pointer variables, Pointer and arrays, array of pointers, pointers and structures, Dynamic allocation. Linked Lists: Concept of a linked list, operations on Singly linked lists: traversal, selection, searching, insertion, deletion, and sorting, overview of circular and doubly linked list. Applications of linked lists.

Section-C

Stacks: Introduction to Stacks, array representation of stack, operations on stack: PUSH, POP, Evaluation of Expression: Concept of precedence and associativity in expressions, Resolving precedence of operators and association of operands, postfix & prefix expressions, conversion of expression from one form to other form using stack (with & without parenthesis), Recursion, Linked list representation of stack, Applications of stacks.

Queues: Queues, array representation of Queues, operations on queue: insertion and deletion, Linked list representation of queue, Overview of priority queue, circular and dequeue. Applications of Queues.

Section-D

Non-Linear Structures: Trees definition, characteristics concept of child, sibling, parent child relationship etc,

binary tree: different types of binary trees based on distribution of nodes, operation on binary tree: insertion, deletion, searching and traversal, traversing: Preorder, Postorder and Inorder, Introduction to binary search tree, operations on BST: insertion, deletion, searching, Application of trees.

Graphs: Definition, Relation between tree & graph, directed and undirected graph, connected and disconnected graph, Depth first and breadth first traversal of graphs, Applications of Graph

Text Books

1. Data Structures with C by Seymour Lipschutz ,McGraw Hill Education(India) Private Limited.
2. Data Structures using C by A. K. Sharma, Pearson Publication.
3. Data Structures using C-YashwantKanetkar Publication.

Reference Books

1. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.
2. Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman Publisher.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO1</u> <u>0</u>	<u>PO1</u> <u>1</u>	<u>PO1</u> <u>2</u>	<u>PO1</u> <u>3</u>
CSH 210 B-T	Data Stru ctur es	<u>CO1</u>	3	3	2	2	1	2	1	1	1	1	1	1	2
		<u>CO2</u>	3	3	2	2	1	2	1	1	1	1	1	1	1
		<u>CO3</u>	3	3	2	2	1	2	1	1	1	1	1	1	1
		<u>CO4</u>	3	3	2	2	1	2	1	1	1	1	1	1	-

Course Title/Code	Data Structures (CSH210B-P)	
Course Type	Core (Allied)	
L-T-P Structure	0-0-2	
Credits	1	
Course Objective	The course should assess how the choice of data structures and algorithm design methods impacts the performance of programs and choose the appropriate data structure and algorithm design method for a specified application.	
Course Outcomes (COs)		Mapping
CO1	To understand the concept of Dynamic memory management, algorithms and their complexity ; demonstrate the abstract properties and operations of Linear data structures (using Static Memory Allocation) : Array ; To apply different Searching and Sorting algorithms.	Skill Development
CO2	Demonstrate the abstract properties and operations of Linear data structures (using Dynamic Memory Allocation) : Link List and variations of Linked List.	Skill Development
CO3	Demonstrate the abstract properties and operations of Linear data structures (using Static & Dynamic Memory Allocation) : Stacks, Queues	Skill Development
CO4	Demonstrate the abstract properties and operations of Non Linear data structures (using Static & Dynamic Memory Allocation) : Trees, Graphs	Skill Development
Prerequisites (if any)	N.A	

List of Experiments:

1. Programs on C language
2. Write a program on Linear search and Binary search Using C
3. Write a program to implement bubble sort, insertion sort, selection sort Programs on Link list
4. Programs on stack
5. Programs on queues
6. Programs on binary trees
7. Traversal
8. Insertion

TEXT BOOKS

1. Data Structures with C by Seymour Lipschutz ,McGraw Hill Education(India) Private Limited.
2. Data Structures using C by A. K. Sharma, Pearson Publication.
3. Data Structures using C-Yashwant Kanetkar Publication.

REFERENCE BOOKS

1. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.
2. Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman Publisher.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
CSH 210 B-P	Data Structures Lab	<u>CO1</u>	3	3	2	2	1	2	1	1	1	1	1	1	2
		<u>CO2</u>	3	3	2	2	1	2	1	1	1	1	1	1	1
		<u>CO3</u>	3	3	2	2	1	2	1	1	1	1	1	1	1
		<u>CO4</u>	3	3	2	2	1	2	1	1	1	1	1	1	-

Course Title/Code	QUANTITATIVE APTITUDE-II (CDO204)	
Course Type	Elective(Allied)	
L-T-P Structure	1-0-2	
Credits	2	
Course Objective	To prepare students with the concepts of quantitative techniques required in aptitude test of various competitive exams & placements.	
	Course Outcomes (COs)	Mapping
CO1	Students will be able to analyze various forms of data	Skill Development
CO2	Students will be able to solve complex problems based on arithmetic reasoning.	Skill Development
CO3	Students will be able to apply short tricks on complex problems of number system.	Skill Development
Prerequisites (if any)	QUANTITATIVE APTITUDE-I (CDO203)	

Unit 1: Number System

- 1.1 Factors and Multiples
- 1.2 Unit Digits & Cyclicity
- 1.3 Remainders
- 1.4 Factorials
- 1.5 Logarithm

Unit 2: Modern Mathematics

2.1 Permutation and Combination

- 2.1.1 Principal of counting and Basic formulas
- 2.1.2 Arrangements, Selection and Selection + Arrangement.
- 2.1.3 Linear/Circular arrangements, Digits and Alphabetic Problems and Applications.

2.2 Probability

- 2.2.1 Events and Sample Space, Basic Formulas.
- 2.2.2 Problems on Coins, Cards and Dices.
- 2.2.3 Conditional Probability, Bayes' Theorem and their Applications.

Unit 3: Data Analytics

3.1 Data Interpretation

- 3.1.1 Table and Bar graph
- 3.1.2 Line and Pie Charts
- 3.1.1 Mixed Charts and Caselets
- 3.1.2 Data Sufficiency

Unit 4: Area & Volume

4.1 Mensuration I- Areas

- 4.1.1 Different types of Triangles and their area and perimeter.
- 4.1.2 Different types of Quadrilateral and their area and perimeter.
- 4.1.3 Circumference and Area of Circle, Area of Sector and length of Sector.
- 4.1.4 Mixed Figures and their Applications.

4.2 Mensuration II- Surface Areas and Volumes

- 4.2.1 Problems on Cubes & Cuboids, Cone, Cylinder and Sphere.
- 4.2.2 Prism and Pyramid.
- 4.2.3 Mixed Figures and their Applications.

Unit 5: Logical Reasoning

- 5.1 Seating Arrangement
- 5.2 Ranking
- 5.3 Syllogism
- 5.4 Calendar
- 5.5 Ages & Numbers

Instructions for paper setting: Fifty MCQ will be set in total. All questions will be compulsory. Each question will be of 1 mark. There will be no negative marking. Calculator will not be allowed.

TEXTBOOKS

- Quantitative Aptitude for Competitive Examinations: R S Aggarwal, S Chand & Company Pvt Ltd, Edition 2017

REFERENCE BOOKS

- A Modern Approach to Verbal & Non Verbal Reasoning: R S Aggarwal, S Chand & Company Pvt Ltd, Edition 2018

CO-PO Mapping

Course Code	Course Name	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CD O204	QUANTITATIVE APTITUDE-II	CO1	1	2	3	-	-	-	-	-	-	-	-	-	13
		CO2	1	2	3	-	-	-	-	-	-	-	-	-	13
		CO3	1	2	3	-	-	-	-	-	-	-	-	-	13

Course Title/Code	MINI PROJECT –II(MAN218B)	
Course Type	Elective(Departmental)	
L-T-P Structure	1-0-2	
Credits	2	
Course Objective	The students will be able to critically evaluate the work done by various researchers relevant to the research topic, integrate the relevant theory and practices followed in a logical way and draw appropriate conclusions, understand the research methodologies/approaches/techniques used in the literature and structure and organize the collected information or findings through an appropriate abstract, headings, reference citations and smooth transitions between sections	
Course Outcomes (COs)		Mapping
CO1	The students will be able to critically evaluate the work done by various researchers relevant to the research topic	Skill Development
CO2	To integrate the relevant theory and practices followed in a logical way and draw appropriate conclusions	Skill Development
CO3	To understand the research methodologies/approaches/techniques used in the literature	Skill Development
CO4	To structure and organize the collected information or findings through an appropriate abstract, headings, reference citations and smooth transitions between sections	Skill Development
Prerequisites (if any)	MINI PROJECT – I(MAN209B)	

Unit-1 Literature Survey (LS)/Design of Experiment

- 1.1 Collection of research papers related to previously identified gap/problem (15 papers or more)
- 1.2 Comprehend and arrange the literature based on the idea framed
- 1.3 Presenting the collected data and inferring it with the further scope of expansion and Designing the experiment wherever applicable.

Unit-2 Structuring of Review Paper and setting up of experimental facility

- 2.1 Analysis of different approach/methodology adopted by various researchers
- 2.2 Listing out the components of the paper/ setting up experimental facility w.r.t the problem
- 2.3 Identification of suitable Journal or Conference
- 2.4 Formatting/Styling the paper according to the respective template

Unit-3 Planning of experiments

- 3.1 Formulate experimental procedures with Modification of the experimental set-up, if required
- 3.2 Procurement of materials

Unit-4 Execution of experiments/simulations

- 4.1 Conduct experiments/ build prototype
- 4.2 Tabulating and recording data
- 4.3 Analysis and interpretation of the data
- 4.4 Comparison of the results with other reported experiments
- 4.5 Interpretation of observations
- 4.6 Integration of relevant theory, findings in a structured way and draw appropriate conclusions

Unit-5 Departmental Presentation

5.1 Structuring and preparation of PPT

5.2 Mock presentation

5.3 Review on presentation skills and content delivered both

5.4 Incorporating the review comments in the slides

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MA N21 8B	Mini Project – II	<u>CO1</u>	2	-	2	-	3	-	-	1	2	2	2	2	-
		<u>CO2</u>	2	-	2	-	3	2	2	-	2	-	-	-	-
		<u>CO3</u>	-	2	-	-	3	2	2	-	2	2	2	2	-
		<u>CO4</u>	-	2	-	-	3	-	-	-	2	2	2	2	-

Course Title/Code	ENVIRONMENTAL ETHICS & SUSTAINABLE DEVELOPMENT(CHS234)	
Course Type	Elective (Allied)	
L-T-P Structure	1-0-2	
Credits	2	
Course Objective	The students would be able to describe, explain and analyses the sustainable development concerns and challenges	
Course Outcomes (COs)		Mapping
CO1	Develop an inter-disciplinary understanding of sustainable development concerns and challenges	Employment
CO2	propose and implement sustainable solutions to environmental issues (grow oyster mushrooms, develop a composting bin)	Skill Development
CO3	understand the concept of sustainability initiatives & sustainability reporting and defend, criticize or compare the sustainability initiatives adopted by different enterprises and initiate a sustainability initiative/develop the sustainability report of the institute	Skill Development
CO4	ustify the importance of contemporary issues like consumption, indigenous knowledge, gender issues, population in achieving sustainable development	Skill Development
Prerequisites (if any)	N.A	

Section A

Introduction to Sustainable Development

Definition of Sustainable Development; Triple Bottom Line, Components of TBL, Changing Perspective & Debates in Sustainable Development - Need for Sustainable Development, Evolution of the concept of Sustainable Development: Stockholm Conference, The Brundtland Commission, Earth Summit, Agenda 21; Millennium Development Goals

Section B

Challenges to Sustainable Development and Sustainable Development Goals (SDGs)

Challenges to Sustainable Development - Agriculture, Population & Food Security, Public Health and Nutrition, Education, Natural Resources (Forests, Energy, Water), Climate Change Sustainable Development Goals (SDGs) - Introduction, Challenges to SDGs, Indian Scenario.

Section C

Sustainability Strategies & Reporting

Sustainability Strategies & Reporting - Introduction, Rationale and Mechanisms, Key Principles, Sustainability Strategies Adopted by Different Enterprises – Case Studies

Section D

Sustainable Development and Contemporary Issues

Sustainable Consumption, Indigenous Knowledge, Gender Issues, Population & Sustainable Agriculture, Sustainable Tourism

Tools: Video lecture; research papers or articles, survey, presentations, white board

LAB EXPERIMENTS/ACTIVITIES

1. Survey - Business and non-business students' perception towards TBL (based on the readings listed above); inferences on the basis of survey; <http://www.aabri.com/manuscripts/121249.pdf>
2. Workshop based - Sustainable agriculture- Mushroom farming
3. Workshop based - Back to nature - DIY composting bin
4. Review - Sustainable Consumption in India: Challenges and Opportunities; Divesh Kumar, Praveen Goyal, Zillur Rahman, Ishwar Kumar; IJMBs Vol. 1, Issue 3, September 2011; <http://www.ijmbs.com/13/devesh.pdf>
5. Calculate Carbon Footprint/Ecological footprint
6. Stimulus Activity (Piece of writing) - Sustainable Consumption
7. CSR - Workshop for Village school children
8. Simulation Activity - Challenges to Sustainable Development
9. Case Studies - Sustainability initiatives @ TATA Motors, CAIRN INDIA, Mahindra & Mahindra, Subaru Isuzu, Disney, Novo Nordisk, etc.

TEXTBOOKS

1. Environmental Management for Sustainable Development; C.J. Barrow; Routledge Publishers
2. Roberts, J.T., and Hite, A., 2000, From Modernization to Globalization - Perspectives on Development and Social Change, Blackwell Publishing
3. Sachs, J., 2004, Stages of Development, Speech at the Chinese Academy of Arts and Sciences
4. Giddings, B., Hopwood, B., and Geoff O'Brien, 2002, Environment, Economy and Society: Fitting Them Together into Sustainable Development, Published online in Wiley Inter Science (www.interscience.wiley.com). DOI: 10.1002/sd.199
5. IPCC, Adaptation to Climate Change in the context of Sustainable Development and Equity, www.ipcc.ch/ipccreports/tar/wg2/pdf/wg2TARchap18.pdf

REFERENCE BOOKS

1. Brundtland Commission, 1987, "Our Common Future", Oxford University Press
2. Food Insecurity Atlas of Rural India (2001) MS Swaminathan Research Foundation and World Food Programme. <http://home.wfp.org/stellent/groups/public/documents/ena/wfp076968.pdf>.
3. Maternal and Child Undernutrition 1 Maternal and child undernutrition: global and regional exposures and health consequences http://www.who.int/nutrition/topics/Lancetseries_Undernutrition1.pdf.

E-Resources (websites/Wikipedia pages/webtutorials/online courses, etc.)

1. Triple Bottom Line (TBL) - <https://www.youtube.com/watch?v=2f5m-jBf81Q>
2. How Humans Made Malaria So Deadly - <https://www.youtube.com/watch?v=64pvlCtH-O>
3. Ocean Confetti! - https://www.youtube.com/watch?v=qVoFeELi_vQ&spfreload=5
4. Sustainability explained through animation - <https://www.youtube.com/watch?v=B5NiTN0chj0>
5. SDGs - <https://www.youtube.com/watch?v=uHEfRAooih8>
6. Micro-plastics - <https://www.youtube.com/watch?v=UpGt5L3GC7o>
7. Sustainable Consumption - <http://www.ijmbs.com/13/devesh.pdf>.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO 1</u>	<u>PO 2</u>	<u>PO 3</u>	<u>PO 4</u>	<u>PO 5</u>	<u>PO 6</u>	<u>PO 7</u>	<u>PO 8</u>	<u>PO 9</u>	<u>PO 10</u>	<u>PO 11</u>	<u>PO 12</u>	<u>PO 13</u>
CHS234	ENVIRONMENTAL ETHICS & SUSTAINABLE DEVELOPMENT	<u>CO1</u>	-	2	-	-	-	-	-	-	2	2	-	-	-
		<u>CO2</u>	-	2	-	-	-	-	-	-	2	2	-	-	-
		<u>CO3</u>	-	2	-	-	-	-	-	-	2	2	-	-	-
		<u>CO4</u>	-	2	-	-	-	-	-	-	2	2	-	-	-

Course Title/Code	CAREER SKILLS –I(CDO205)	
Course Type	Elective (Allied)	
L-T-P Structure	3-0-0	
Credits	0	
	Course Outcomes (COs)	Mapping
CO1	To improve students basic knowledge about Arithmetic Aptitude	Skill Development
CO2	To make students solve aptitude problems quickly utilizing the short cuts	Skill Development
CO3	To make students have the ability to ‘quickly think on their feet’	Skill Development
CO4	To strengthen students communication skills	Skill Development
Prerequisites (if any)	N.A	

Part A – Quantitative Aptitude

Section A: Arithmetic Aptitude I

- 1.1 Mixture & Alligation
- 1.2 Number System 2
 - 1.2.1 Unit digit
 - 1.2.2 Remainders
 - 1.2.3 Factors
 - 1.2.4 Factorials
- 1.3 Data Interpretation

Unit 2: Reasoning

- 2.1 Number, Ranking & Time sequence Test
- 2.2 Syllogism
- 2.3 Logical Reasoning
 - 2.3.1 Seating Arrangement
 - 2.3.2 Linear and Circular arrangement puzzle
 - 2.3.3 Cross Variable puzzle

Part B – Soft Skills

Unit 3: Personality Development

- 3.1 Concept of personality
- 3.2 Self awareness
 - 3.2.1 Different learning styles
 - 3.2.2 Areas of Self awareness
 - 3.2.3 Developing self-awareness
- 3.3 Goal Setting
 - 3.3.1 Five principles of goal setting
 - 3.3.2 Setting “SMART” goals
 - 3.3.3 6P’s of goal setting
 - 3.3.4 SWOT analysis
- 3.4.5 Short term & Long term goals

Unit 4: Presentation Skills

- 4.1 Designing the presentation
- 4.2 Audience and content analysis

4.3 Delivering the presentation- Preparation, Practice, Performance

Unit 5: Professional Communication

5.1 Email writing

5.2 Diction and Speech Clarity

5.3 LSRW & Introduction to verbal ability as an assessment tool for employability

Instructions for paper setting: Fifty MCQ will be set in total. All questions will be compulsory. Each question will be of 1 marks. There will be no negative marking. Calculator not allowed. Time allotted would be 2 hours.

Assessment Tools:

Sessional tests

Term end examination scores

Class performance

Home assignments

Online assignments

Class attendance

TEXTBOOKS

1. A Modern Approach to Reasoning: R S Aggarwal, S Chand & Company Pvt Ltd
2. Quicker Maths- M. Tyra , BSC publication

REFERENCE BOOKS

1. Quantitative Aptitude- Arun Sharma, Mc Graw Hill Publication.

e-Resources (websites/Wikipedia pages/webtutorials/online courses, etc.)

<http://www.indiabix.com/aptitude/questions-and-answers/>

<http://www.indiabix.com/non-verbal-reasoning/questions-and-answers/>

<https://www.sawaal.com/>

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>	
CD O205	CA REE R SKILLS -I	<u>CO1</u>	1	-	-	-	-	1	-	-	-	-	-	1	1	
		<u>CO2</u>	1	-	-	2	-	-	-	-	-	-	-	-	1	
		<u>CO3</u>	1	-	-	-	-	1	-	-	-	-	-	-	1	1
		<u>CO4</u>	1	-	-	1	-	-	-	-	-	1	3	-	2	2

MAU01 – 5th SEMESTER

Course Title/Code	NUMERICAL ANALYSIS(MAH301B)	
Course Type	CORE (DEPARTMENTAL)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	Students would be able to understand and apply concepts of numerical techniques for solving the mathematical problems and their applications.	
	Course Outcomes (COs)	Mapping
CO1	Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.	Skill Development
CO2	Apply numerical methods to obtain approximate solutions to mathematical problems.	Skill Development
CO3	Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.	Skill Development
CO4	Analyze and evaluate the accuracy of common numerical methods	Skill Development
Prerequisites (if any)	N.A	

Section A

Errors & Interpolation: Errors in numerical calculations introduction, Numbers and their accuracy, Absolute, Relative and Percentage errors and their analysis, General error formula.

Introduction to interpolation, Newton's formula for equi-spaced points. Lagrange approximation, Newton's divided difference formula, Hermite interpolation.

Curve fitting by a straight line and a second degree curve and laws reducible to linear law.

Section B

Solution of nonlinear equations Bracketing methods for locating a root, Initial approximations and convergence criteria, Bisection method, RegulaFalsi, Newton- Raphson and Secant method.

Numerical differentiation and integration: Approximating the derivatives, Numerical differentiation formulas (forward, backward and central-Gauss Forward, Gauss Backward, Stirling), Introduction to numerical quadrature, Newton- cotes formula, Gaussian quadrature - Gauss Legendre & Gauss Chebyshev's.

Section C

Solution of linear systems: Direct methods, Gaussian elimination, Gauss Jordan, Matrix inversion, UV factorization, Iterative methods for linear systems (Gauss Seidel & Gauss Jacobi), LU decomposition. Eigen value problems: Jacobi and Given's methods for symmetric matrices, Power and inverse power methods.

Section D

Solution of differential equations: Introduction to differential equations, Initial value problems, Picard's method, Taylor series method, Euler's methods, classical method of Runge-Kutta method of order IV, Predictor-Corrector methods (Milne's & Adam's Bashforth). Partial differential equations: Solution of hyperbolic, parabolic (Bender Schmidt and Crank Nicolson Method) and elliptic equations.

TEXTBOOKS

- Numerical Methods in Engineering. & Science : B.S. Grewal.

REFERENCE BOOKS

- Numerical Methods for Scientific and Engineering. Computations: M.K. Jain, S.R.K. Iyenger and R.K. Jain-Wiley Eastern Ltd.

E-Resources

<https://nptel.ac.in/courses/111107105>

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>
MAH301B	NUMERICAL ANALYSIS	<u>CO1</u>	3	1	3	2	3	-	2	-	3	2	3	2
		<u>CO2</u>	3	1	3	2	3	-	2	-	3	2	3	2
		<u>CO3</u>	3	1	3	2	3	-	2	-	3	2	3	2
		<u>CO4</u>	3	1	3	2	3	-	2	-	3	2	3	2

Course Title/Code	LINEAR ALGEBRA (MAH302B)	
Course Type	Core (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	The students would be able to apply the concepts of Vector Space, Linear Transformation and inner product Space required for solving the mathematical problems and their applications.	
Course Outcomes (COs)		Mapping
CO1	Apply the concepts of vector spaces, subspaces, bases, dimension and their properties in related mathematical problems and spaces.	Skill Development
CO2	Find Relationship between matrices and linear transformations apply the same in real world problems.	Skill Development
CO3	Understand and apply the properties of inner product spaces and orthogonality in inner product spaces in related mathematical problems and spaces.	Skill Development
CO4	Recognise importance of adjoint of a linear transformation and its canonical form.	Skill Development
Prerequisites (if any)	N.A	

Section A

Vector spaces, Subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vector space, Finite dimensional vector spaces, Invariance of the number of elements of bases sets, Dimensions, Quotient space and its dimension.

Section B

Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vector spaces, Null Space, Range space of a linear transformation, Rank and Nullity Theorem, Algebra of Linear Transformation, Minimal Polynomial of a linear transformation, Singular and non-singular linear transformations Vector space of all the linear transformations Dual Spaces, Bi dual spaces, Annihilator of subspaces of finite dimensional vector spaces, Matrix of a linear Transformation, Change of basis.

Section C

Eigen values and Eigen vectors of linear transformations, Eigen space, Similar matrices, Diagonalisation, Bilinear and quadratic forms.

Section D

Inner product spaces, Cauchy-Schwarz inequality, Orthogonal vectors, Orthogonal complements, Orthogonal sets and Basis, Bessel's inequality for finite dimensional vector spaces, Gram-Schmidt,

Orthogonalization process, Adjoint operator of a linear transformation and its properties.

TEXTBOOKS

1. Joseph A. Gallian, Contemporary Abstract Algebra(4th Edition), Narosa Publishing House
2. Stephen H. Friedberg, Arnold J. Insel & Lawrence E. Spence, Linear Algebra (4th Edition), Prentice- Hall of India Pvt. Ltd, New Delhi

REFERENCE BOOKS

1. Hoffman & Kunze : Linear Algebra

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MAH302B	LINEAR ALGEBRA	<u>CO1</u>	3	3	3	3	2	1	2	-	2	1	2	-	-
		<u>CO2</u>	3	3	3	3	2	2	2	-	2	1	2	-	-
		<u>CO3</u>	3	2	3	2	1	1	2	-	2	1	1	-	-
		<u>CO4</u>	3	1	3	1	1	-	2	-	2	1	1	-	-

Course Title/Code	METRIC SPACES (MAH303B)	
Course Type	Core(Deptt.)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the students with the concept of metric spaces, completeness, compactness and connectedness	
Course Outcomes (COs)		Mapping
CO1	understand and solve problems on metric space, open ball, sphere, interior, closed & open set, convergence	Skill Development
CO2	analyze and prove, theorems and problems related to completeness and compactness of a metric space.	Skill Development
CO3	analyze and prove, theorems and problems related to connectedness of a metric space.	Skill Development
CO4	recognise importance of metric spaces in mathematical sciences	Skill Development
Prerequisites (if any)	N.A	

Section-A

Metric Space-Basic Concepts: Definition and examples of metric spaces, Semi metric space, Bounded and unbounded metric space, Sphere or ball, Interior, Neighborhood, open set, limit point, isolated point, Derived set, closed set, Exterior, Frontier

Sequences in a metric space, Convergence in a metric space, Cauchy sequence, Complete metric space, Cantor's intersection theorem.

Section-B

Completeness: First Category space, Second category space, Baire's category theorem, Contraction on a metric space Continuity in a metric space:

Continuous functions, Uniform continuity, Isometry, Homeomorphism, Extension theorem

Section-C

Compactness: Covers, Compact spaces and sets, Sequentially compactness, The Heine- Borel theorem, Countably compact, Continuity and compactness.

Section-D

Connectedness: Connected set, Connected subsets, Intermediate Value Theorem, connected component, Totally disconnected set, Path wise connectedness.

TEXTBOOKS

1. E. T. Copson, Metric Spaces- Cambridge University Press
2. Mícheál O'Searcoid, Metric Space-Springer Verlag, Ny . Inc.

REFERENCE BOOKS

1. P. K. Jain, Khalil Ahmad, Metric Space, Alpha Science International, New Delhi.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO 1</u>	<u>PO 2</u>	<u>PO 3</u>	<u>PO 4</u>	<u>PO 5</u>	<u>PO 6</u>	<u>PO 7</u>	<u>PO 8</u>	<u>PO 9</u>	<u>PO1 0</u>	<u>PO1 1</u>	<u>PO1 2</u>	<u>PO1 3</u>
MAH303 B	METRIC SPACES	<u>CO1</u>	3	2	3	2	3	-	2	-	2	1	1	-	-
		<u>CO2</u>	3	2	3	2	3	-	2	-	2	1	1	-	-
		<u>CO3</u>	3	2	3	2	3	-	2	-	2	1	1	-	-
		<u>CO4</u>	3	2	3	2	3	-	2	-	2	1	1	-	-

Course Title/Code	INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS(CSH321B-T)	
Course Type	Elective (Allied)	
L-T-P Structure	3-0-0	
Credits	3	
Course Objective	To introduce the basic concepts related to DBMS, Relational Database Design and Data Mining	
Course Outcomes (COs)		Mapping
CO1	Acquire the knowledge about file systems, database concepts and structured query language.	Skill Development
CO2	Design, create and manage/manipulate database systems using SQL, Relational Algebra and Relational Calculus.	Skill Development
CO3	Design ER Models and convert the same to relational model	Skill Development
CO4	Identify constraints, Design and Decompose the Database using Formal and Informal methods including FD, Normalization	Skill Development
CO5	Understand the principles of Transaction Processing, Concurrency control methods and recovery techniques.	Skill Development
Prerequisites (if any)	N.A	

Section-A

Data Base Concepts: Data base vs. file oriented approach, Data Independence, Data Base Models, General Architecture of a Data Base Management Software Components of a DBMS, Advantages and Disadvantages of DBMS, Introduction to SQL (Insertion of Data, Updating in the data, Alteration in the Schema, Data Fetching, Functions)

Section-B

Relational model – Mathematical formulation, Relation and its properties, domain compatibility, Relational algebra – set operations (union, intersect, difference, cross product), relational operations (select, project, division, joins-cross, inner/outer, theta, natural), Tuple calculus, Relational Calculus, SQL (Set Operations, group by, order by, Joins)

Section-C

Relational Database design: Relational Database Design and ER Model (Entity, Relationship, Strong Entity, Weak Entity, Type of Attributes and their representation), Functional dependencies, Finding keys; 1st to 3rd NFs, BCNF, Lossless Join and Dependency preserving decomposition.

Section-D

Introduction to Data Mining: Data mining definition & task, KDD versus data mining, Data Mining Applications, Data preprocessing, Data mining techniques: Market Basket Analysis, Frequent Itemsets, Closed Itemsets, and Association Rules(Apriori Algorithm), Mining Multilevel Association Rules, Mining Multidimensional Association Rules, Correlation Analysis.

TEXTBOOKS

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems (5th Ed.), Pearson Education. 2010

2. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts (5th Ed.), McGraw Hill. , 2013.
3. Data Mining- Concepts & Techniques; Jiawei Han & Micheline Kamber- 2001, Morgan Kaufmann

REFERENCE BOOKS

1. R. Ramakrishanan, J. Gehrke, Database Management Systems (3rd Ed.), McGraw-Hill. 2002
2. Modern Database Management by Feffray A. lioffcr, Mary B. Prcscotl, Fred R Mefaddcn, 6th edition. Pearson Education.

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO 1</u>	<u>PO 2</u>	<u>PO 3</u>	<u>PO 4</u>	<u>PO 5</u>	<u>PO 6</u>	<u>PO 7</u>	<u>PO 8</u>	<u>PO 9</u>	<u>PO 10</u>	<u>PO 11</u>	<u>PO 12</u>	<u>PO 13</u>
CSH32 1B-T	INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS	<u>CO1</u>	2	1	2	1	-	-	-	-	1	-	1	1	-
		<u>CO2</u>	3	1	3	2	3	-	-	-	2	1	3	2	-
		<u>CO3</u>	2	2	3	3	3	-	-	-	3	2	3	2	-
		<u>CO4</u>	3	2	3	2	2	-	-	-	2	1	3	2	-
		<u>CO5</u>	1	1	2	-	-	1	-	1	1	-	2	1	-

Course Title/Code	INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS Lab (CSH321B-P)	
Course Type	Elective (Allied)	
L-T-P Structure	0-0-2	
Credits	1	
Course Objective	To introduce the basic concepts related to DBMS, Relational Database Design and Data Mining	
Course Outcomes (COs)		Mapping
CO1	Acquire the knowledge about file systems, database concepts and structured query language.	Skill Development
CO2	Design, create and manage/manipulate database systems using SQL, Relational Algebra and Relational Calculus.	Skill Development
CO3	Design ER Models and convert the same to relational model	Skill Development
CO4	Identify constraints, Design and Decompose the Database using Formal and Informal methods including FD, Normalization	Skill Development
CO5	Understand the principles of Transaction Processing, Concurrency control methods and recovery techniques.	Skill Development
Prerequisites (if any)	N.A	

LIST OF EXPERIMENTS:

Note: MyAccess/MySQL may be used.

1. DDL statement
 - Create table, alter table, drop table
2. DML Statement
 - Select , update, delete, insert statements
 - Condition specification using Boolean and comparison operators (and, or, not, =, <, >, <=, >=)
 - Arithmetic operators and aggregate function (Count, sum, avg, Min, Max)
 - Multiple table queries
 - Nested select statements
 - Set manipulation using (any, in, contains, all, not in, not contains, exists, not exists, union, intersect, minus, etc.)
 - Categorization using group by...having
 - Arranging using order by
3. Introduction to Data mining Tool : Weka

TEXTBOOKS

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems (5th Ed.), Pearson Education. 2010
2. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts (5th Ed.), McGraw Hill. , 2013.
3. Data Mining- Concepts & Techniques; Jiawei Han & Micheline Kamber- 2001, Morgan Kaufmann

REFERENCE BOOKS

3. R. Ramakrishanan, J. Gehrke, Database Management Systems (3rd Ed.), McGraw-Hill. 2002
4. Modern Database Management by Feffray A. lioffcr, Mary B. Prcscotl, Fred R Mefaddcn, 6th edition. Pearson Education.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO 1</u>	<u>PO 2</u>	<u>PO 3</u>	<u>PO 4</u>	<u>PO 5</u>	<u>PO 6</u>	<u>PO 7</u>	<u>PO 8</u>	<u>PO 9</u>	<u>PO 10</u>	<u>PO 11</u>	<u>PO 12</u>	<u>PO 13</u>
CSH32 1B-P	INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS Lab	<u>CO1</u>	2	1	2	1	-	-	-	-	1	-	1	1	-
		<u>CO2</u>	3	1	3	2	3	-	-	-	2	1	3	2	-
		<u>CO3</u>	2	2	3	3	3	-	-	-	3	2	3	2	-
		<u>CO4</u>	3	2	3	2	2	-	-	-	2	1	3	2	-
		<u>CO5</u>	1	1	2	-	-	1	-	1	1	-	2	1	-

Course Title/Code	MATHS LAB-IV (MAH307B)	
Course Type	Core (Departmental)	
L-T-P Structure	0-0-2	
Credits	1	
Course Objective	This course will enable the students to generate code for various Numerical Techniques using software.	
Course Outcomes (COs)		Mapping
CO1	Obtain numerical solutions of algebraic and transcendental equations.	Skill Development
CO2	Find numerical solutions of system of linear equations and check the accuracy of the solutions.	Skill Development
CO3	Learn about various interpolating and extrapolating methods.	Skill Development
CO4	Solve initial and boundary value problems in differential equations using numerical methods.	Skill Development
CO5	Apply various numerical methods in real life problems.	Skill Development
Prerequisites (if any)	MATH LAB III	

LAB EXERCISES

- 1: Interpolation: To find the value of a dependent variable for a given value of an independent variable using Newton divided difference interpolation for a given set of data.
- 2: Interpolation: To find the value of a dependent variable for a given value of an independent variable using Newton divided difference interpolation for a given set of data.
- 3: To find roots of algebraic and transcendental equations using Bisection method.
- 4: To find roots of algebraic and transcendental equations using Regula Falsi method.
- 5: To find roots of algebraic and transcendental equations using Newton Raphson method.
- 6: Numerical Integration: To find the value of a definite integral using Trapezoidal rule of integration.
- 7: Numerical Integration: To find the value of a definite integral using Simpson's 1/3 rule of integration.
- 8: Numerical Integration: To find the value of a definite integral using Simpson's 3/8 rule of integration.
- 9: To find the solution of an ordinary differential equation of first order by Euler's method.
- 10: To find the solution of an ordinary differential equation of first order by R-K method.

TEXTBOOKS

1. M.K Jain, Numerical Methods for Scientist and Engineering Computation, New Age Publications

REFERENCE BOOKS

1. R.K Jain, SRK Iyengar, R.K Jain, Numerical Methods: Problem and Solutions, New Age International

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MAH307B	MATH LAB IV	<u>CO1</u>	1	-	-	2	-	3	-	-	3	-	-	-	
		<u>CO2</u>	1	-	-	2	-	3	-	-	3	-	-	-	
		<u>CO3</u>	1	-	-	2	-	3	-	-	3	-	-	-	
		<u>CO4</u>	1	-	-	-	-	3	-	-	3	-	-	-	
		<u>CO5</u>	-	-	-	-	-	3	-	-	3	-	-	-	

Course Title/Code	CAREER SKILL-II(CDO303)	
Course Type	Audit	
L-T-P Structure	2-0-0	
Credits	0	
Course Objective	To be able to do mathematical computations on geometry, algebra and develop verbal reasoning	
Course Outcomes (COs)		Mapping
CO1	Students will be able to apply the short tricks on geometry & calculation problems.	Skill Development
CO2	Students will be able to solve problems on Modern Mathematics & Numbers.	Skill Development
CO3	Students will be able to analysis and solve data related problems.	Skill Development
CO4	Students will be able to use their vocabulary and grammar to solve complex questions	Skill Development
CO5	Students will be able to write formal text with accuracy and ease	Skill Development
CO6	Students will be able to develop speed reading	Skill Development
Prerequisites (if any)	Career Skill –I(CDO205)	

Part A – Quantitative Aptitude

Unit 1: Geometry and Mensuration

1.1 Geometry

- 1.1.1 Basic geometry & Theorems, Lines & Angles
- 1.1.2 Polygons, Triangle and Quadrilaterals
- 1.1.3 Circles

1.2 Mensuration I- Areas

- 1.2.1 Different types of Triangles and their area and perimeter.
- 1.2.2 Different types of Quadrilateral and their area and perimeter.
- 1.2.3 Circumference and Area of Circle, Area of Sector and length of Sector.
- 1.2.4 Mixed Figures and their Applications.

1.3 Mensuration II- Surface Areas and Volumes

- 1.3.1 Problems on Cubes & Cuboids, Cone, Cylinder and Sphere.
- 1.3.2 Prism and Pyramid.
- 1.3.3 Mixed Figures and their Applications.

Unit 2: Algebra

- 2.1 Linear & Quadratic equations
- 2.2 Mathematical inequalities
- 2.3 Maximum & Minimum Values
- 2.4 Integral Solutions

Unit 3: Verbal Reasoning

- 3.1 Cubes & Dice
- 3.2 Inserting Missing Characters
- 3.3 Clocks

Part B - Employability Enhancement & Verbal Ability

Unit 4: Communication Accuracy

- 4.1 Relevance of Verbal Ability and preparatory guidelines
- 4.2 Functional Grammar – Subject Verb Agreement
- 4.3 Tenses – Perfect, Simple, Continuous

4.4 Common Errors and rectification

Unit 5: Word Power Building Skills

5.1 Words: Antonyms, Synonyms, Verbal Analogies

5.2 Compound words: Homophones, Homonyms, Word Families

5.3 Root Word Technique for Prefixes & Suffixes

5.4: Word Power: 7 Tips for Learning New Words

5.5 Practice Vocabulary Exercises

Unit 6: Reading & Writing Skills

6.1 Objectives of Reading, Definition & Types of Reading & Importance of Reading

6.2 Reading Techniques: SW3R, Active Reading, Detailed, Speed

6.3 Practice Exercises: Short & Medium Passages
3.1 Writing: Introduction of Writing Skills, Objectives of enhancing Writing Skills & Types of Writing

6.4 Sentences, Phrases, Types of Sentences, Parts of Sentences

6.5 Paragraph Writing: Construction, Linkage & Cohesion

Instructions for paper setting: Fifty MCQ will be set in total. All questions will be compulsory. Each question will be of 1 mark. There will be no negative marking. Calculator not allowed. Time allotted would be 2 hours.

Assessment Tools:

Sessional tests

Term end examination scores

Class performance & Home assignments

Online assignments & Class attendance

TEXTBOOKS

1. Quantitative Aptitude for Competitive Examinations: R S Aggarwal, S Chand & Company PvtLtd, Edition 2017
2. A Modern Approach to Verbal& Non Verbal Reasoning: R S Aggarwal, S Chand & Company Pvt Ltd, Edition 2018

REFERENCE BOOKS

1. Verbal Ability and Reading Comprehension: MVN Enterprises

Weblinks:

<http://www.indiabix.com/aptitude/questions-and-answers/>

<http://www.indiabix.com/non-verbal-reasoning/questions-and-answers/>

<https://www.sawaal.com/>

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO 1</u>	<u>PO 2</u>	<u>PO 3</u>	<u>PO 4</u>	<u>PO 5</u>	<u>PO 6</u>	<u>PO 7</u>	<u>PO 8</u>	<u>PO 9</u>	<u>PO1 0</u>	<u>PO1 1</u>	<u>PO1 2</u>	<u>PO1 3</u>	
CDO303	CAREER SKILL-II	<u>CO1</u>	1	-	-	-	-	1	-	-	-	-	-	1	1	
		<u>CO2</u>	1	-	-	2	-	-	-	-	-	-	-	-	-	1
		<u>CO3</u>	1	-	-	-	-	1	-	-	-	-	-	-	1	1
		<u>CO4</u>	1	-	-	1	-	-	-	-	1	3	-	2	2	2
		<u>CO5</u>	1	-	-	1	-	1	-	-	1	3	-	2	2	2
		<u>CO6</u>	1	2	-	1	1	1	1	1	1	1	3	1	2	2



DETAILED SYLLABUS
MAU01 – 6th SEMESTER

Course Title/Code	LINEAR PROGRAMMING & GAME THEORY(MAH309B)	
Course Type	Elective (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	The students would be able to apply the concepts of Linear Programming, Transportation problems and Game theory required for solving the mathematical problems and their applications.	
Course Outcomes (COs)		Mapping
CO1	Understanding the concepts and tools of linear programming problem & Game theory.	Skill Development
CO2	Solve different problems of linear programming problem & Game theory with real world limitations/applications.	Skill Development
CO3	Apply OR techniques constructively to make effective business decisions.	Skill Development
CO4	Analyse and construct the mathematical models used in Operations Research and learn to apply the restrictions on problems.	Skill Development
Prerequisites (if any)	N.A	

Section-A

Introduction to linear programming problem, Formulation, Solution by graphical, Theory of simplex method, Optimality and unbounded-ness, The simplex algorithm, Simplex method in tableau format. Introduction to artificial variables, Two-phase method, Big M method and their comparison. **Duality, Formulation of the dual problem, Primal-dual relationships, Dual Simplex, Economic interpretation of the dual.**

Section-B

Transportation problem and its mathematical formulation, North-west corner method least cost method and Vogel approximation method for determination of starting basic solution, Algorithm for solving transportation problem, Assignment problem and its mathematical formulation, **Hungarian method for solving assignment problem, Travelling salesman problem.**

Section-C

Game theory: Formulation of two person zero sum games, Solving two person zero sum games, games with mixed strategies, **Graphical solution procedure, Linear programming solution of games.**

Section-D

Sequencing: Sequencing problems: Introduction, assumptions, processing of n - jobs through 2 machines, **Processing of n - jobs through 3 machines. Processing of n-jobs through m-machines.**

TEXTBOOKS

1. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, Linear Programming and Network Flows (2nd edition), John Wiley and Sons, India, 2004.

REFERENCE BOOKS

1. S. Hillier and G. J. Lieberman, Introduction to Operations Research (9th Edition), Tata McGraw Hill, Singapore, 2009.
2. Hamdy A. Taha, Operations Research, An Introduction (8th edition), Prentice - Hall India, 2006
3. Hadley, Linear Programming, Narosa Publishing House, New Delhi, 2002.

e-Resources

<https://archive.nptel.ac.in/content/storage2/courses/110106059/Module%201/Lecture%201.pdf>

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>P10</u>	<u>PO1</u> <u>1</u>	<u>PO1</u> <u>2</u>	<u>PO1</u> <u>3</u>
MAH309B	MATH LAB IV	<u>CO1</u>	3	1	2	3	2	-	-	-	-	2	-	-	-
		<u>CO2</u>	3	1	2	3	2	-	1	1	1	2	-	-	-
		<u>CO3</u>	3	1	2	3	2	-	1	1	1	2	-	-	-
		<u>CO4</u>	3	1	2	3	2	-	1	1	1	2	-	-	-
		<u>CO5</u>	3	1	2	3	2	-	-	-	-	2	-	-	-

Course Title/Code	DISCRETE MATHEMATICS(MAH311B)	
Course Type	Elective (Departmental)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	To equip the students with the concepts of counting, permutation and combination, Recurrence relations and graph theory required for solving the mathematical problems and their applications	
Course Outcomes (COs)		Mapping
CO1	To demonstrate concepts of partial order relation and lattices.	Skill Development
CO2	Apply basic counting techniques to solve combinatorial problems	Skill Development
CO3	Simplify Boolean functions by using the basic Boolean algebraic properties and K-map.	Skill Development
CO4	Apply algorithms and theorems that are treated in the course for solving graph theoretical problems.	Skill Development
CO5	Solve & analyze the Mathematical problems related to Set POSET and Graph using mathematical software.	Skill Development
Prerequisites (if any)	N.A	

SECTION A

Ordered Sets: Relations, Definitions, Examples and basic properties of ordered sets, Order isomorphism, Hasse diagrams, Dual of an ordered set, Duality principle, Maximal and minimal elements.

Lattice: Lattices as ordered sets, Lattices as algebraic structures, Sublattices, Products and homomorphisms; Definitions, Examples, and properties of modular and distributive lattices, Complemented lattice.

SECTION B

Boolean algebra: Introduction to Boolean algebra and Boolean functions, Different representations of Boolean functions, Application of Boolean functions to synthesis of circuits. Karnaugh maps. Karnaugh diagrams, switching circuits and applications of switching circuits.

Counting Techniques: Pigeonhole principle, Basic counting principles, Binomial and multinomial theorems, Combinatorial identities, Inclusion and Exclusion principle. Recurrence relations, generating functions, solution of recurrence relations using difference equations and generating functions.

SECTION C

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers.

SECTION D

Graph Theory: Definitions, Examples and Basic Properties of Graph, Types of Graph, Matrix Representation of Graph, Isomorphic Graph, Path and Cycles, Eulerian and Hamiltonian paths and cycles, Weighted Graph, Travelling Salesman Problem, Shortest Path, Dijkstra's Algorithm.

Tree, Planar Graph & Coloring: Digraphs, Planer graphs, Euler formula, Graph Colouring, Chromatic

numbers. Tree, Properties of Trees, Spanning Trees, Algorithm for Constructing Spanning Trees (BFS and DFS), Minimal Spanning Tree, Algorithms for Constructing Minimal Spanning Tree (Kruskal's and Prim's).

TEXTBOOKS

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications, 4th edition, Wadsworth Publishing Co. Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.
4. M.K. Sen (Author), D.S. Malik (Author), Discrete Mathematics: Theory and Applications, Cengage.

REFERENCE BOOKS

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and Its Application to Computer Science”, TMG Edition, Tata McGraw- Hill
2. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schum's Outlines Series, Seymour Lipchitz, Marc Lipson,
3. Discrete Mathematics, Tata McGraw - Hill

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	<u>PO10</u>	<u>PO11</u>	<u>PO12</u>	<u>PO13</u>
MAH311B	DISCRETE MATHEMATICS	<u>CO1</u>	3	3	3	3	-	-	2	-	2	-	-	-	-
		<u>CO2</u>	3	3	3	3	-	-	2	-	2	-	-	-	-
		<u>CO3</u>	3	3	3	3	1	-	2	-	2	-	1	-	-
		<u>CO4</u>	3	3	3	3	2	-	2	-	2	-	1	-	-
		<u>CO5</u>	-	-	-	-	-	3	1	-	2	-	2	3	-

Course Title/Code	CAREER SKILL-III(CDO305)	
Course Type	Audit	
L-T-P Structure	3-0-0	
Credits	0	
Course Objective	To equip the students with the concepts of Permutation, combination, probability, verbal and non-verbal reasoning.	
Course Outcomes (COs)		Mapping
CO1	Students will be able to apply the short tricks on geometry & calculation problems.	Skill Development
CO2	Students will be able to solve problems on Modern Mathematics & Numbers.	Skill Development
CO3	Students will be able to analysis and solve data related problems.	Skill Development
CO4	Students will be able to use their vocabulary and grammar to solve complex questions	Skill Development
CO5	Students will be able to write formal text with accuracy and ease	Skill Development
CO6	Students will be able to develop speed reading	Skill Development
Prerequisites (if any)	Career skill-I & II(CDO205, CDO303)	

Part A – Quantitative Aptitude

Unit 1 : **Permutation and Combination**

- 1.1 Principal of counting and Basic formulas
- 1.2 Arrangements, Selection and Selection + Arrangement.
- 1.3 Linear/Circular arrangements, Digits and Alphabetic Problems and Applications.

Unit 2 : **Probability**

- 2.1 Events and Sample Space, Basic Formulas.
- 2.2 Problems on Coins, Cards and Dices.
- 2.3 Conditional Probability, Bayes' Theorem and their Applications.

Unit 3: **Verbal & Non-Verbal Reasoning**

- 3.1 Calendar
- 3.2 Puzzle Test
- 3.3 Non-Verbal Reasoning

Part B - Employability Enhancement

Unit 4: **Professional Writing**

- 4.1. Profiling on Social Sites: LinkedIn, Facebook, Instagram
- 4.2. Cover Letter/Emails
- 4.3. Resume Writing

Unit 5: **Group Discussions**

- 5.1. Do's and Dont's of a Group Discussion
- 5.2. Roles played in a Group Discussion
- 5.3. Tips for Cracking a Group Discussion

Unit 6: **Managing Interviews**

- 6.1. Developing the employability mindset
- 6.2. Preparing for Self -Introduction

- 6.3. Researching the employer
- 6.4. Portfolio Management
- 6.5. Answering Questions in an Interview

Instructions for paper setting: Fifty MCQ will be set in total. All questions will be compulsory. Each question will be of 1 mark. There will be no negative marking. Calculator not allowed. Time allotted would be 2 hours.

Assessment Tools:

- Sessional tests
- Term end examination scores
- Class performance & Home assignments
- Online assignments & Class attendance

e-Resources (websites/Wikipedia pages/webtutorials/online courses, etc.)

TEXTBOOKS

1. A Modern Approach to Reasoning: R S Aggarwal, S Chand & Company Pvt Ltd
2. Quicker Maths- M. Tyra , BSC publication

REFERENCE BOOKS

1. Quantitative Aptitude- Arun Sharma, Mc Graw Hill Publication.

Weblinks:

- <http://www.indiabix.com/aptitude/questions-and-answers/>
- <http://www.indiabix.com/non-verbal-reasoning/questions-and-answers/>
- <https://www.sawaal.com/>

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>PO 1</u>	<u>PO 2</u>	<u>PO 3</u>	<u>PO 4</u>	<u>PO 5</u>	<u>PO 6</u>	<u>PO 7</u>	<u>PO 8</u>	<u>PO 9</u>	<u>PO1 0</u>	<u>PO1 1</u>	<u>PO1 2</u>	<u>PO1 3</u>
CDO3 05	CAREER SKILL -III	<u>CO1</u>	1	-	-	-	-	1	-	-	-	-	-	1	1
		<u>CO2</u>	1	-	-	2	-	-	-	-	-	-	-	-	1
		<u>CO3</u>	1	-	-	-	-	1	-	-	-	-	-	1	1
		<u>CO4</u>	1	-	-	1	-	-	-	-	1	3	-	2	2
		<u>CO5</u>	1	-	-	1	-	1	-	-	1	3	-	2	2
		<u>CO6</u>	1	2	-	1	1	1	1	1	1	3	1	2	2

Course Title/Code	ENTREPRENEURSHIP THEORY AND PRACTICES (MCH109)	
Course Type	Elective (Allied)	
L-T-P Structure	3-1-0	
Credits	4	
Course Objective	Recognize the entrepreneurial potential within yourself and in your environment; Appreciate the role of entrepreneurship within society, at the level of the organization, and in your own personal life; Understand the process, nature of entrepreneurship, and ways to manage the process; this course will introduce to the basic knowledge of various aspects of Entrepreneurship.	
	Course Outcomes (COs)	Mapping
CO1	To acquaint the students with the fundamentals principles of Entrepreneurial theory & practices	Skill Development
CO2	To enable the students to prepare, analyze and interpret the start-up economy	Skill Development
CO3	To enable the students to take decisions using applicable tools and techniques.	Skill Development
CO4	To enable the students to take decisions using innovation & creative invention	Skill Development
Prerequisites (if any)	NA	

SECTION A

Defining Entrepreneurship; what is an Entrepreneurial Mindset? The Entrepreneurial Process; An Integrative Model of Entrepreneurship. “Who” is the Entrepreneur? Sociological and Psychological Characteristics; The Different Types of Entrepreneurs; Nature versus Nurture, Why Entrepreneurs are not Born

SECTION B

Understanding The Nature of Opportunity & Defining Opportunity; An Opportunity is Different from a Business Concept; Sources and Types of Opportunity; Discovery versus Search; Where are the Emerging Opportunities; Evaluating Opportunity; Factors that Undermine an Opportunity; Windows of Opportunity; Understanding the Market and the Customer Needs. Entrepreneurial Skills such as Communication, Design Thinking, Personal Selling, and Risk and Resilience

SECTION C

Developing a Great Business Concept and Business Model From Product to Business Concept (the Value Proposition), From Business Model to Business Plan; The Nature of Successful Business Concepts; Sources of Concepts; What Makes for a Good Concept; Components of a Complete Business Model; A Look at Successful and Failed Business Models

SECTION D

Expectations about Size, Growth, Returns, and Risk, What About the Investment Model (Income, Growth, or Speculative)?; Ways of Extracting Returns from the Venture; Types of Ventures; What it Takes to Actually Start a Venture; Four Ways to Enter a Market; The Concept of Risk; Types of Risk; Assessing in a New Venture; Risk and Return.

Recommended Books:

1. Rajeev Roy , “Entrepreneurship”, 2nd ed, Oxford Higher Education, 2011
2. Bruce R. Barringer and R. Duane Ireland, Entrepreneurship: Successfully Launching New Ventures, 3rd Edition, Pearson Prentice Hall (2009).

3. Nandini Vaidyanathan. Entrepedia, A Step-by –step Guide to Becoming An Entrepreneur In India, 2nd ed, Publisher: Embassy Books Publishers & Distributors, 2011.

CO-PO Mapping

<u>Course Code</u>	<u>Course Name</u>	<u>Course Outcome</u>	<u>P O1</u>	<u>P O2</u>	<u>P O3</u>	<u>P O4</u>	<u>P O5</u>	<u>P O6</u>	<u>P O7</u>	<u>P O8</u>	<u>P O9</u>	<u>PO 10</u>	<u>PO 11</u>	<u>PO 12</u>	<u>PO 13</u>
MCH 109	ENTREPRENEURIAL THEORY AND PRACTICES	CO1	1	2	1			2		1	1	2	1	1	1
		CO2	2	1	2	1		2	3	1	3	1	1	1	2
		CO3	1	1	2	1	2	1		2	1		2		1
		CO4	2	1	3	X	2	1		2	2			1	1