Mathematics-I		L	T	P	Credit
MA 101 S1	Scheme	3	1	0	04

- **DIFFERENTIAL CALCULUS**   (10 Hours)
  Differentiation of Hyperbolic and Inverse Hyperbolic functions. Successive Differentiation, standard forms, Leibnitz's theorem and applications, Power series, Expansion of functions, Taylor's and Maclaurin's series. Curvature, Radius of curvature for Cartesian curve with application.

- **PARTIAL DIFFERENTIATION**   (10 Hours)
  Partial differentiation, Euler's theorem for homogeneous function, Modified Euler's theorem, Taylor's and Maclaurin's series for two variables. Tangent plane and Normal line, Error and Approximation, Jacobians with properties, Extreme values of function of two variables, Lagrange's methods of undetermined multipliers

- **CURVE TRACING**   (05 Hours)
  Cartesian, polar and parametric form of standard curves.

- **BETA AND GAMMA FUNCTION**   (04 Hours)
  Beta and Gamma function with their properties and duplications formula without proof.

- **DOUBEL INTEGRALS**   (08 Hours)
  Reorientation of concepts of integrals and Double integrals, evaluation techniques, change of order of Integration, change of variable, Application of double integrals for evaluation of area and volume.

- **TRIPLE INTEGRALS**   (05 Hours)
  Triple integrals, evaluation techniques, Application of triple integrals for evaluation of volume.

(Total Lecture Hours: 42)

Books Recommended:
1. James Steward De Calculas, Thomson Asia, Singapore, 2003.
2. O'Neil Peter., "Advanced Engg. Mathematics", Thompson, Singapore, Ind. Ed. 2002.
3. Kreyszing E., "Advanced Engineering Mathematics", John Wiley & Sons, Singapore, Int. Student Ed. 2015.
4. Wiley C. R., "Advanced Engineering Mathematics", McGraw Hill Inc., New York Ed. 1993.
5. F. B. Hilderband, "Methods of Applied mathematics", PHI, New Delhi, 1968

Reference Books:
1. Ramana D. V., "Higher Engg. Mathematics", The MaGraw-Hill Inc., New Delhi, 2007.
2. Srimanta Pal, Subodh C. Bhunia, " Engineering Mathematics", Oxford University Press, New Delhi, 2015.
3. Bali and Iyengar. Engg. Mathematics, Laxmi Publications, New Delhi, 2004.

English & Professional Communication

HU 110 S1
HU 110 S2

	L	T	P	Credit
Scheme	3	0	0	03

- **COMMUNICATION** (05Hours)

  Introduction to Communication, Different forms of Communication, Barriers to Communication and some remedies, Non Verbal Communication – Types, Non-Verbal Communication in Intercultural Context

- **COMMON ERRORS** (02Hours)

  Common Errors, Indianisms through *Goodbye Party for Miss Pushpa T.S.* (Poem by Nissim Ezekiel)

- **LISTENING SKILLS** (05 Hours)

  Effective Listening – Process, Types- Appreciative, comprehensive, empathetic, analytical, Modes of Listening-Active and Passive, Listening and note taking practice, Listening for various purposes-Practice and activities

- **SPEAKING SKILLS** (12 Hours)

  Effective Speaking- Informal Speech, JAM, Presentation Skills- types, preparation and practice Interviews- types, preparation and mock interview; Group Discussion- types, preparation and practice

- **READING SKILLS** (05 Hours)

  Reading Skills- **Comprehension (unseen passage- literary /scientific / technical)** Reading with fluency and speed, Skimming and scanning, identifying relevant information, isolating fact from opinion Understanding concepts and arguments, Identifying distinctive features of language

- **WRITING SKILLS** (13 Hours)

  Technical Writing- types and practice, Memo, Letter Writing- types and practice, Email etiquette and Netiquette, Résumé writing- types and practice, Report Writing -types and practice, Editing- practice

(Total Lecture Hours: 42)

BOOKS RECOMMENDED:

1. Kumar, Sanjay and Pushp, Lata. Communication Skills, 2nd Edition, OUP, New Delhi, 2015.
2. Raman, Meenakshi & Sharma Sangeeta. Technical Communication Principles and Practice, 3rd Edition, OUP, New Delhi, 2015.
3. Sharma R.C. & Mohan Krishna. Business Correspondence and Report Writing, 3rd Edition, Tata McGraw Hill, New Delhi, 2007.
4. Raymond V. Lesikar and Marie E Flatley. Basic Business Communication skills for Empowering the Internet generation. Tata McGraw Hill publishing company limited. New Delhi 2005.
5. Ezekiel, Nissim. Goodbye Party for Miss Pushpa T.S., http://www.english-for-students.com/Goodbye-Party.html

Holistic Empowerment and Human Values		L	T	P	Credit
HU 107 S1					
HU 107 S2	Scheme	3	0	0	00

- **INTRODUCTION** (06 hours)
  Motivation behind the course, Holistic Empowerment, Mental, Spiritual and Social Health

- **HUMAN VALUES AND ETHICS** (12 hours)
  Positive Attitude and Professional Ethics, Values through Literature, Sustainable Leadership for Professional and Personal Effectiveness, Social Media Pros and Cons.

- **HEALTH AND MEDICATION** (12 hours)
  Awareness about life style diseases, Emotional Intelligence, Substance Abuse, Life Management Skills

- **PHYSICAL FITNESS AND MENTAL HEALTH** (12 hours)
  Importance of games and exercises on Physical Fitness, Importance of Yoga and Meditation on Physical and Mental Health

(Total Lecture Hours:42)

Books Recommended:
1. Chakraborty, S. K. and Chakraborty, Debanshu, Human Values and Ethics: Achieving Holistic Excellence, The ICFAI University Press, Hyderabad, (2006).
2. Gaur, R.R., Sangal, R. and Bagaria, G.P., A Foundation Course in Human Values and Professional Ethics
3. R. Subramanian, Professional Ethics, Oxford University Press, (2013).
4. Kalam, A P J Abdul, Ignited Minds: Unleashing the Power Within India, Penguin; Latest edition (12 November 2014), ISBN-13: 978-0143424123
5. Kalam, A P J Abdul, Wings of Fire: An Autobiography, Universities Press; 1st edition (1999), ISBN-10: 8173711461
6. Priestley, J. B., An Inspector Calls, Three Acts Play
7. http://livingvalues.net/ Living Values Education Activities for Young Adults, Book 1: 2019
8. Living Values Education Activities for Young Adults, Book 2: 2019

Mathematics-II

MA 112 S2   Scheme

	L	T	P	Credit
	3	1	0	04

- **ORDINARY DIFFERENTIAL EQUATION**   **(10 Hours)**
  Reorientation of differential equation first order first degree, exact differential equation and Integrating factors, first order higher degree odes, solvable for p, y and x, Solution of homogenous equations higher order, complementary functions, Particular Integrals, Linear differential equation with variable coefficient, Cauchy's Euler and Legendre's equation with variable coefficient, Method of variation of parameters.

- **APPLICATION OF DIFFERENTIAL EQUATION (Mathematical Modelling)**   **(07 Hours)**
  Modeling of Real world problems particularly Engineering System, Electrical network models (LCR), spread of epidemic (SI, SIS, SIR), Newton's Law of cooling, Single compartment modelling, Bending of beam models.

- **SERIES SOLUTION AND SPECIAL FUNCTIONS**   **(07 Hours)**
  Regular point, Singular point, series solution of ODE of 2nd order with variable coefficient with special emphasis to differential equation of Legendre's and Bessel's for different cases of roots of indicial equations.

- **INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATION**   **(07 Hours)**
  Introduction to Partial differential equation, Formation of partial differential Equation, Partial differential Equation of first order, Linear partial differential equation of first order (Pp + Qq =R) and method of obtaining its general solution, Non-linear partial differential equation of first order $f(p, q)=0$, $f(z, p, q)=0$, $f(x, p)= g(y, q)$, $z= px + qy + f(p, q)$.

- **VECTOR CALCULUS**   **(07 Hours)**
  Scalar and vector point function, differential operator, gradient, directional derivative, divergence, curl and Laplacian operator with their properties, Line integral, Surface Integral, Volume integral, Green's, Gauss and Stokes theorem (Only statement) & application.

- **SYSTEM OF LINEAR ALGEBRIC EQUATION**   **(04 Hours)**
  Linear systems, Elementary row and column transformation, rank of matrix, consistency of linear system of equations, Linear Independence and Dependence of vectors, Gauss Elimination method, Gauss-Jorden Method, Gauss-Jacobi Iteration Method.

                                                      (Total Lecture Hours: 42)

Books Recommended:
1. Kreyszing E., "Advanced Engineering Mathematics", John Wiley & Sons, Singapore, Int. Student Ed. 2015.
2. James Steward De, "Calculus", Thomson Asia, Singapore, 2003.
3. O'Neel Peter., "Advanced Engg. Mathematics", Thompson, Singapore, Ind. Ed. 2002.
4. F. B. Hilderband, "Methods of Applied mathematics", PHI, New Delhi, 1968
5. Wiley C. R., "Advanced Engineering Mathematics", McGraw Hill Inc., New York Ed. 1993.

Reference Books
1. Ramana D. V., "Higher Engg. Mathematics", The MaGraw-Hill Inc., New Delhi, 2007.
2. Hay George E., "Vector and Tensor Analysis". Dover Publications, 2012.
3. Srimanta Pal, Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press, New Delhi, 2015.
4. Mary L. Boas, Mathematical Methods in the Physical Sciences, John Wiley & Sons, Ed.2005.
5. J. N. Kapur , Mathematical Models in Biology and Medicine. East west Press, New Delhi 1985.

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Foundation Course in Mathematics-I		L	T	P	Credit
MAMA 103 S1	Scheme	3	1	0	04

- **SET THEORY** (7 Hours)

  Sets, Intervals, Boundedness of sets,Supremum and infimum, Neighborhood, interior points, Open and closed sets, Limits points, Bolzano – Weierstrass Theorem, Countable and uncountable sets, Compact sets and related results. Finite Sets, Countable sets, Schroder –Berstein Theorem and Knaster – Tarski Theorem, Axoim of choice, Zorn's Lemma, Haussdorff's Maximality Principle and Well – Ordering Theorem and their equivalence.

- **RELATIONS AND FUNCTIONS** (7 Hours)

  Definitions, Types of relations and related properties, Cartesian product, One to one and onto functions, composite functions, inverse of a function, Binary operations. Function as a special kind of relation from one set to another. Real valued function of the real variable, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum and greatest integer functions with their graphs. Sum, difference, product and quotients of functions.

- **PARTIAL ORDER SET** (7 Hours)

  Basic Definitions: Partial Order, least element, greatest element, maximal element, minimal element, upper bound, lower bound, least upper bound, greatest lower bound, total order and totally ordered sets, chain. Hasse Diagrams and Lattices.LUB Property, GLB Property and their equivalence

- **LIMITS AND CONTINUITY OF FUNCTIONS ON R** (7 Hours)

  Limit of a function, Theorems on limits, Continuity of functions and properties, Uniform continuous functions and related results. Definitions of derivatives and related results, Increasing and decreasing functions, Darboux's theorem, Rolle's theorem, Mean value theorems of differential calculus and their applications.

- **FUNCTIONS OF BOUNDED VARIATIONS** (7 Hours)

  Functions of bounded variations and their properties, Variation function and related results, Jordon theorem, Vector valued functions, Vector valued functions of bounded variation and related results

- **PRINCIPLE OF MATHEMATICAL INDUCTION** (7 Hours)

  Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers.The principle of mathematical induction (weak and strong) and simple applications.

Total Lecture Hours: 42+Tutorial Hours: 15

Books Recommended:
1. W. Rudin: Principles of Mathematical Analysis, 3rd Edition, McGraw Hill, New York 1976.
2. S.C. Malik and Savita Arora: Mathematical Analysis, 2nd Edition, New Age International (P) Limited, New Delhi, 1994.
3. T. Apostol: Mathematical Analysis, 2nd ed., Narosa Publishers, 2002.
4. H. L.Royden: Real Analysis, 3rd Edition, Macmilan Publishing Co. Inc., New York, 4th Ed., 1993.
5. N.S. Gopalakrishnan: University Algebra- New Age International (P) Limited, New Delhi, 2018
6. Joseph.A. Gallian: Contemporary Abstract Algebra, 9th Edition, Cengage Learning, 2016

Foundation Course in Mathematics-II		L	T	P	Credit
MAMA 114 S2	Scheme	4	0	0	04

Group Theory

- **UNIT-I**   **(6 Hours)**
  Binary relation, Function, Binary Operation, Groups, Various properties and examples of group, Subgroups, Properties of subgroups, Normal subgroups and important results, Cyclic groups, generator, Properties of Cyclic groups.

- **UNIT-II**   **(6 Hours)**
  Cosets, Lagrange's theorem, Euler theorem, Fermat's theorem (with proofs), Isomorphism and homomorphism of groups and their examples and results, Quotient group.

- **UNIT-III**   **(6 Hours)**
  First, Second and Third Isomorphism Theorems (with proofs), Direct product of groups and its related results.

- **UNIT-IV**   **(6 Hours)**
  Permutations, even and odd permutations, transportation, disjoint cycles, permutation groups and its related results, Cayley's theorem, Cauchy's theorem (with proofs)

Trigonometry

- **UNIT-V**   **(10 Hours)**
  Exponential values of sines, cosines and hyperbolic functions. Inverse circular and hyperbolic functions. Logarithm of the complex quantities.

- **UNIT-VI**   **(08 Hours)**
  Gregory's series. Summation of series. Infinite product of sine and cosine

(Total Lecture Hours: 42 + Tutorial Hours: 15)

Text Book:

1. N.S. Gopalakrishnan: University Algebra- New Age International (P) Limited, New Delhi, 2018
2. Joseph.A. Gallian: Contemporary Abstract Algebra, 9th Edition, Cengage Learning, 2016
3. J.B. Fraleigh: "First Course in Abstract Algebra", A. Third Editon, Narosa Publishing House New Delhi 2003.
4. S. L. Loney: Plan Trignometry-I, Palala Press, 2016
5. S. L. Loney: Plan Trignometry-II, Palala Press, 2016