Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Mathematics
Five Years Integrated M.Sc. Mathematics

Sr. No.	Subject	Code	Scheme L-T-P	Credits (Min.)	Notional hours of Learning (Approx.)
	First Semester (1st year of MSc)				
1	Foundation Course in Mathematics-I	MA101	3-1-0	4	70
2	Calculus-I	MA103	3-1-0	4	70
3	Computer Programming using C/C++	MA131	3-0-2	4	85
4	English and Professional Communication	HS110	3-1-0	4	70
5	Fundamentals of Physics	PH113	3-0-2	4	85
			Total	**20**	**380**
6	Vocational Training / Professional Experience (Optional) (mandatory for exit)	MAV01 / MAP01	0-0-10	5	200 (20 x 10)
	Second Semester (1st year of MSc)				
1	Foundation Course in Mathematics-II	MA102	3-1-0	4	70
2	Calculus-II	MA104	3-1-0	4	70
3	Python Programming	MA132	3-0-2	4	85
4	Fundamentals of Physics-II	PH106	3-0-2	4	85
5	Chemistry	CY112	3-0-2	4	85
6	Indian Value System and Social Consciousness	HS120	2-0-0	2	35
			Total	**22**	**430**
7	Vocational Training / Professional Experience (Optional) (mandatory for exit)	MAV02 / MAP02	0-0-10	5	200 (20 x 10)
	Third Semester (2nd year of MSc)				
1	Element of Analysis	MA201	3-1-0	4	70
2	Analytical Geometry	MA203	3-1-0	4	70
3	Discrete Mathematical Structure	MA205	3-1-0	4	70
4	Data Structure	MA231	3-0-2	4	85
5	English and Professional Communication – II	HS201	3-1-0	4	70
			Total	**20**	**365**
6	Mathematical Software-I Vocational Training / Professional Experience (Optional) (mandatory for exit)	MAV03 / MAP03	0-0-10	5	200 (20 x 10)
	Fourth Semester (2nd year of MSc)				
1	Numerical Analysis	MA202	3-1-0	4	70
2	Linear Algebra	MA204	3-1-0	4	70
3	Elementary Number theory	MA232	3-1-0	4	70
4	Computational Life Science	MA233	3-1-0	4	70
5	Computer Networks	CS208	3-0-2	4	85

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			Total	**20**	**365**
6	Mathematical Software-II Vocational Training / Professional Experience (Optional) (mandatory for exit)	MAV04 / MAP04	0-0-10	5	200 (20 x 10)
	Fifth Semester (3rd year of MSc)				
1	Ordinary Differential Equations	MA301	3-1-0	4	70
2	Mechanics	MA303	3-1-0	4	70
3	Probability and Statistics-I	MA331	3-1-0	4	70
4	Analysis of Algorithms	MA332	3-1-0	4	70
5	Elective (Open Elective)	MA3AA	3-X-X	¾	55/70/85
			Total	**19-20**	**335-365**
6	Mini Project-I Preliminary Part-I Vocational Training / Professional Experience (Optional) (mandatory for exit)	MAV05 / MAP05	0-0-10	5	200 (20 x 10)
	Sixth Semester (3rd year of MSc)				
1	Complex Analysis	MA302	3-1-0	4	70
2	Continuum Mechanics	MA304	3-1-0	4	70
3	Metric Space	MA333	3-1-0	4	70
4	Fundamentals of Artificial Intelligence	CS300	3-0-2	4	85
5	Elective (Open Elective)	MA3BB	3-X-X	¾	55/70/85
			Total	**19-20**	**335-380**
6	Mini Project-I Preliminary Part-II Vocational Training / Professional Experience (Optional) (mandatory for exit)	MAV06 / MAP06	0-0-10	5	200 (20 x 10)
	Seventh Semester (4th year of MSc)				
1	Functional Analysis	MA401	3-1-0	4	70
2	Abstract Algebra	MA403	3-1-0	4	70
3	Fluid Dynamics	MA405	3-1-0	4	70
4	Optimization Techniques	MA431	3-1-0	4	70
5	Elective (Core Elective)	MA4AA	3-X-X	3/4	55/70/85
6	MOOC Course*	MA457	3-0-0/ 3-1-0	3/4	55/70/85
			Total	**23-24**	**390-450**
7	Mini Project-II Preliminary Part-I Vocational Training / Professional Experience (Optional) (mandatory for exit)	MAV07 / MAP07	0-0-10	5	200 (20 X 10)
	Eighth Semester (4th year of MSc)				
1	Topology	MA402	3-1-0	4	70
2	Higher Transcendental Functions	MA404	3-1-0	4	70
3	Partial Differential Equations	MA406	3-1-0	4	70
4	Calculus of Variations & Integral Equations	MA432	3-1-0	4	70

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5	Elective (Core Elective)	MA4CC	3-X-X	4	55/70/85
6	MOOC Course*	MA458	3-0-0/ 3-1-0	3/4	**390-450**
			Total	**23-24**	**335-365**
7	Mini Project-II Preliminary Part-II Vocational Training / Professional Experience (Optional) (mandatory for exit)	MAV08 / MAP08	0-0-10	5	200 (20 X 10)
	Ninth Semester (5th year of MSc)				
1	Measure Theory and Integration	MA501	3-1-0	4	70
2	Advanced Mathematical Modelling and Simulation	MA503	3-0-2	4	85
3	Probability and Statistics-II	MA531	3-1-0	4	70
4	Financial Mathematics	MA532	3-1-0	4	70
5	Elective (Core Elective)	MA5AA	3-X-X	4	55/70/85
			Total	**20**	**350-380**
	Tenth Semester (5th year of MSc)				
1	Dissertation**	MAP10	0-0-40	20	800 (40x 20)
			Total	**20**	**800**

*Students will be required to opt any one Massive Open Online Courses (MOOC) course through NPTEL / SWAYAM platform in Semester- VII and Semester VIII excluding the courses of the existing curriculum of five years integrated programme in mathematics. Necessary approval from the department is required before the registration of the courses on above platform. The credit of the courses through above platform will be considered as per the norms of the institute.

** Students can continue their dissertation work along with the internship / placement, if offered by the companies through CDC of SVNIT Surat. However, student will be required to complete their dissertation work and viva voce examination as per the academic calendar of the institute

Sr. No.	**Optional Core**	**Code**	**Scheme L-T-P**
1	Computer Programming using C/C++	MA131	3-0-2
2	Python Programming	MA132	3-0-2
3	Data Structure	MA231	3-0-2
4	Elementary Number theory	MA232	3-1-0
5	Computational Life Science	MA233	3-1-0
6	Probability and Statistics-I	MA331	3-1-0
7	Analysis of Algorithms	MA332	3-1-0
8	Metric Space	MA333	3-1-0
9	Optimization Techniques	MA431	3-1-0
10	Calculus of Variations & Integral Equations	MA432	3-1-0

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11	Probability and Statistics-II	MA531	3-1-0
12	Financial Mathematics	MA532	3-1-0

Sr. No.	Elective	Code	Scheme L-T-P
1	Advance Mathematical Methods-I	MA351	3-1-0
2	Stochastic Differential Equations	MA352	3-1-0
3	Mathematical Modelling	MA353	3-1-0
4	Integral and Wavelet Transform	MA354	3-1-0
6	Fuzzy Set theory	MA356	3-1-0
7	Block Chain Technology	CS360	3-0-2
8	Sobolev Space	MA451	3-1-0
9	Advance Mathematical Methods-II	MA452	3-1-0
10	Natural Language Processing	CS461	3-0-2
11	Data Analytics	MA453	3-0-2
12	Multi Objective Optimization	MA454	3-1-0
13	Evolutionary Algorithms	MA455	3-1-0
14	Advance Operations Research	MA551	3-1-0
15	Fluid Dynamics in Porous Media	MA552	3-1-0
16	Advanced Numerical Analysis	MA553	3-1-0
17	Linear Operator and Approximation Theory	MA554	3-1-0

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Mathematics
Five Years Integrated M.Sc. Mathematics

M.Sc. I (Mathematics) Semester – I FOUNDATION COURSE IN MATHEMATICS-I MA101	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, students will be able to:
CO1	interpret basic concepts of set-theoretic identities like countability and well-ordering principle.
CO2	demonstrate knowledge of functions and relations on sets.
CO3	demonstrate knowledge of POSET, GLB, LUB, Hasse diagrams, etc.
CO4	determine the convergence and divergence of sequence and series.
CO5	Interpret limit, continuity, and differentiability of functions.

2.	Syllabus	
	SET THEORY	**(08 Hours)**
	Sets, Intervals, Boundedness of sets, Supremum and infimum, and Countable and uncountable sets. Well- Ordering Theorem and their equivalence, Process of the proof by mathematical induction, 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.	
	RELATIONS AND FUNCTIONS	**(08 Hours)**
	Definitions, Types of relations and related properties, Cartesian product, One to one and onto functions, composite functions, the inverse of a function, and Binary operations. Function as a special kind of relation from one set to another. The 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.	
	PARTIALLY ORDERED SET	**(08 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.	
	REAL SEQUENCES	**(07 Hours)**
	Sequences, Limit points of a sequence, Limits inferior and superior, Convergent sequences, non-Convergent sequences, Cauchy's general principle of convergence, Algebra of sequences, Some important theorems, and Monotonic sequences.	
	INFINITE SERIES	**(07**

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		Hours)
	Introduction, Positive term series, Comparison test, Cauchy's root test, D'Alembert's test, Raabe's test, Logarithmic test, Integral test, Gauss's test, Series with arbitrary terms, Rearrangement of terms.	
	LIMITS AND CONTINUITY OF FUNCTIONS ON R	**(07 Hours)**
	Neighbourhood, Interior points, Open and closed sets, Limit points, 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.	
	Tutorials will be based on the coverage of the above topics separately.	**(15 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours=60 Hours)	

3.	**Tutorials**
1	Tutorial will be based on Set theory-I
2	Tutorial will be based on Set theory-II
3	Tutorial will be based on Relations and functions-I
4	Tutorial will be based on Relations and functions-II
5	Tutorial will be based on the Partially ordered set-I
6	Tutorial will be based on the Partially ordered set-II
7	Tutorial will be based on Sequences-I
8	Tutorial will be based on Sequences-II
9	Tutorial will be based on Infinite Series
10	Tutorial will be based on Limit and Continuity

4.	**Books Recommended:**
1	W. Rudin, Principles of Mathematical Analysis, 3rd Edition, McGraw Hill, New York, NY, 1976.
2	S.C. Malik and Savita Arora, Mathematical Analysis, 2nd Edition, New Age International (P) Limited, New Delhi, India, 1994.
3	T. Apostol, Mathematical Analysis, 2nd Edition, Narosa Publishers, India, 2002.
4	H. L. Royden, Real Analysis, 4th Edition, Macmillan Publishing Co. Inc., New York, NY, 1993.
5	N.S. Gopalakrishnan, University Algebra, New Age International (P) Limited, New Delhi, India, 2018.

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Five Years Integrated M.Sc. Mathematics

M.Sc. I (Mathematics) Semester – I CALCULUS-I MA103	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, students will be able to:
CO1	analyze first-order ordinary differential equations and it solutions with different methods.
CO2	apply differential equations to model real-world problems in different fields.
CO3	develop series solutions of ordinary differential equations.
CO4	apply different techniques to evaluate multiple integrals.
CO5	use multiple integrals to calculate area and volume.

2.	Syllabus	
	ORDINARY DIFFERENTIAL EQUATION	**(10 Hours)**
	Reorientation of the 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 Modeling)	**(08 Hours)**
	Modeling of Real-world problems, particularly Engineering Systems, Electrical network models (LCR), the spread of epidemic (SI, SIS, SIR), Newton's Law of cooling, Single compartment modeling, Bending of beam models.	
	BETA AND GAMMA FUNCTION	**(05 Hours)**
	Beta and Gamma function with their properties and duplications formula without proof.	
	SERIES SOLUTION AND SPECIAL FUNCTIONS	**(08 Hours)**
	The regular point, Singular point, series solution of ODE of 2nd order with variable coefficient with special emphasis on the differential equation of Legendre's and Bessel's for different cases of roots of indicial equations.	
	DOUBLE INTEGRALS	**(08 Hours)**

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	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	**(06 Hours)**
	Triple integrals, Evaluation techniques, Application of triple integrals for evaluation of volume.	
	Tutorials will be based on the coverage of the above topics separately.	**(15 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours= 60 Hours)	

3.	**Tutorials**
1	Tutorial will be based on Ordinary Differential Equations-I
2	Tutorial will be based on Ordinary Differential Equations-II
3	Tutorial will be based on applications of ODE-I
4	Tutorial will be based on applications of ODE-II
5	Tutorial will be based on Beta and Gamma functions-I
6	Tutorial will be based on Beta and Gamma functions-II
7	Tutorial will be based on some special functions and series solutions-I
8	Tutorial will be based on some special functions and series solutions-II
9	Tutorial will be based on double integrals
10	Tutorial will be based on triple integrals.

4.	**Books Recommended:**
1	E. Kreyszing, "Advanced Engineering Mathematics", John Wiley & Sons, Singapore, International Student Edition, 2015.
2	J. S. De, "Calculus", Thomson Asia, Singapore, 2003.
3	P. O'Neel, "Advanced Engineering Mathematics", Thompson, Singapore, Indian Edition, 2002.
4	F. B. Hildebrand, "Methods of Applied Mathematics", PHI, New Delhi, 1968.
5	C. R. Wiley, "Advanced Engineering Mathematics", McGraw Hill Inc., New York Edition, 1993.

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	Additional Reference Books
1	B. V. Ramana, "Higher Engineering Mathematics", The McGraw-Hill Inc., New Delhi, 2007.
2	G. E. Hay, "Vector and Tensor Analysis", Dover Publications, 2012.
3	S. Pal and S. C. Bhunia, "Engineering Mathematics", Oxford University Press, New Delhi, 2015.
4	M. L. Boas, "Mathematical Methods in the Physical Sciences", John Wiley & Sons, Edition 2005.
5	J. N. Kapur, "Mathematical Models in Biology and Medicine", East West Press, New Delhi, 1985.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Mathematics
Five Years Integrated M.Sc. Mathematics

M.Sc. I (Mathematics) Semester – I COMPUTER PROGRAMMING USING C/C++ MA131	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, students will be able to:
CO1	elaborate the number system
CO2	demonstrate the data types operators library functions, etc., of C and C++ language.
CO3	develop computer code using control statements, arrays, structures, and pointers in C and C++.
CO4	design user-defined functions in C and C++
CO5	utilize the concept of object-oriented programming.

2.	Syllabus	
	NUMBER SYSTEMS	**(04 Hours)**
	Introduction and type of Number system, Conversion between number system, Arithmetic operations in different number systems, Signed and unsigned number system.	
	C PROGRAMMING BASICS	**(10 Hours)**
	Characteristics of C language, Identifiers, and keywords, Data types, Constants and Variables, Types of C Constants, Types of C Variables, Declarations and Statements, Representation of expressions, Classification of Operators and Library Functions for Data input and output statements, Form of a C Program, Formatted input and output statements, Comments in a C Program.	
	CONTROL STATEMENT, DATA STRUCTURES, POINTERS	**(12 Hours)**
	Decision Control Instruction, Loop control instructions, case-control instructions, One-dimensional array of numbers and characters, Two-dimensional array, Introduction and development of user-defined functions, Different types of Variables and Parameters, Structure and union, Introduction to pointers, Pointer arithmetic, Array of pointers, Pointers, and functions, Pointers and structures, File handling operations.	
	FUNCTIONS	**(07 Hours)**
	Functions, Passing the arguments, return values from functions, Recursion, Header Files Design, File handling operations, Read and Write to Secondary Devices, and Read and Write to Input and Output	

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	Ports.	
	C++ PROGRAMMING: INTRODUCTION	**(12 Hours)**
	Need of Object-Oriented Programming, Characteristics of Object-Oriented Languages, C++ and C, Input, output statements, Comments, Objects, and Classes: defining the class, using the class, Constructors, Objects as function arguments, Operator Overloading: Overloading unary operators, Overloading binary operators, Data conversion. Inheritance: Derived Class and Base Class, Derived Class Constructors, Overriding Member Functions, Multiple Inheritance.	
	Practical's will be based on the coverage of the above topics separately.	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours= 75 Hours)	

3.	**Practical**
1.	Practical based on basics of C programming
2.	Practical based on CONTROL STATEMENT and loops using C programming
3.	Practical based on the array using C programming
4.	Practical based on POINTERS in using C programming
5.	Practical based on structures using C programming
6.	Practical based on Function using C programming
7.	Practical based on CONTROL STATEMENT and loops using C++ programming
8.	Practical based on the array using C++ programming
9.	Practical based on POINTERS in using C++ programming
10.	Practical based on structures using C++ programming
11.	Practical based on Function using C++ programming
12.	Practical based on Objects and Classes using C++ programming
13.	Practical based on Operator Overloading using C++ programming
14.	Practical based on inheritance using C++ programming

4.	**Books Recommended:**
1	Gottfried B.S., “Programming with C Schaum’s outline Series”, 2/E, Tata McGraw-Hill, 2006.
2	Brian W. Kernighan and Dennis M. Ritchie, “The C Programming language”, 2/E, Prentice Hall PTR

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	publication, 1988.
3	E. Balagurusamy, “Programming in ANSI C”, 6/E, Tata Mc-Graw Hill, 2012.
4	Pradip Dey, “Programming in C”, 2/E, Oxford University Press, 2012.
5	Robert Lafore, “Object-Oriented Programming in C++”, 4th Ed. SAMS, Indianapolis, Indiana, USA, 2002.
6	YashavantKanetkar, “Let Us C++”, BPB Publications, India, 2020.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Mathematics
Five Years Integrated M.Sc. Mathematics

M.Sc. (Mathematics) Semester – I ENGLISH AND PROFESSIONAL COMMUNICATION HS110	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, students will be able to:
CO1	Show enhanced reception towards the use of English language.
CO2	Choose and employ appropriate words for professional communication.
CO3	Develop sentences and text in English coherently and formally.
CO4	Demonstrate overall improvement in oral communication.
CO5	Analyze and infer from written and oral messages.

2.	Syllabus	
	COMMUNICATION	**(05 Hours)**
	Introduction to Communication, Different Forms of Communication, Barriers to Communication and some remedies, Non-Verbal Communication – Types, Non-Verbal Communication in Intercultural Context	
	VOCABULARY AND USAGE OF WORDS	**(05 Hours)**
	Common Errors, Synonyms, Antonyms, Homophones, and Homonyms; One Word Substitution; Misappropriations; Indianisms; Redundant Words.	
	LANGUAGE THROUGH LITERATURE	**(09 Hours)**
	Selected short stories, essays, and poems to discuss nuances of the English language.	
	LISTENING AND READING SKILLS	**(06 Hours)**
	Types of listening, Modes of Listening-Active and Passive, Listening and note-taking practice, Practice and activities, Reading Comprehension (unseen passage- literary /scientific/technical),Skimming and scanning, fact vs opinion, Comprehension practice	
	SPEAKING SKILLS	**(10 Hours)**
	Effective Speaking, JAM, Presentation Skills- types, preparation, and practice. Interviews- types, preparation and mock interview; Group Discussion- types, preparation, and practice	
		(10 Hours)

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	Prerequisites of effective writing, Memo-types, Letter Writing- types, Email etiquette and Netiquette, Résumé-types, Report Writing and its types, and Editing.	
	Tutorials will be based on the coverage of the above topics separately	**(15 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

3.	**Tutorials**
1	Letter and Resume
2	Group Discussion
3	Presentation Skills (Individual)
4	Role Play on Nonverbal communication
5	Group Presentation
6	Debate
7	Body language and intercultural communication
8	Listening Activities
9	Editing
10	Report Writing
11	Mock interviews
12	JAM

4.	**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	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.
4	Courtland L. Bovee, John V. Thill, and Mukesh Chaturvedi. "Business Communication Today." Ninth Edition. Pearson, 2009.
5	Mike Markel. "Practical Strategies for Technical Communication," Bedford/ St. Martin's Second Edition, 2016
6	Laura J. Gurak and John M. Lannon. "Strategies for Technical Communication in the Workplace," Pearson, 2013.

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Mathematics
Five Years Integrated M.Sc. Mathematics

M.Sc. I (Mathematics) Semester – I FUNDAMENTAL OF PHYSICS PH113	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, students will be able to:
CO1	Enhance the basic principles of physics related to solid-state physics, quantum mechanics, photonics, and electromagnetism.
CO2	Illustrate the various physical phenomena with interpretation based on the mathematical expressions involved.
CO3	Apply the concepts/principles to solve the problems related to solid-state physics, quantum mechanics, photonics, and electromagnetism.
CO4	Analyze and examine the solution to the problems using physical and mathematical concepts involved.
CO5	Interpret and justify the results obtained from the experiments.

2.	Syllabus	
	SOLID-STATE PHYSICS	**(12 Hours)**
	Crystallography – Crystalline and amorphous solids, Lattice and unit cell, seven crystal system and Bravais lattices, Symmetry operation, Miller indices, Atomic radius, Coordination number, Packing factor calculation for SC, BCC, FCC, Bragg's law of X-ray diffraction, Rotating crystal method, Laue Method, Powder crystal method. *Nanomaterials* – Introduction, Synthesis of Nanomaterials, Top down and Bottom up approach, Ball milling, PVD method, Applications. *Superconductivity* – Meissner effect, Type-I, and Type-II superconductors. *Semiconductor physics* – Introduction, Direct and indirect band gap semiconductors, Intrinsic and extrinsic semiconductors, Law of Mass action, Charge neutrality, Hall effect.	
	QUANTUM MECHANICS	**(10 Hours)**
	Inadequacy of classical mechanics (black body radiation, photoelectric effect, bright line optical spectra), Electron diffraction, de Broglie concept of matter waves, Wave and Particle duality of radiation and matter, Heisenberg's uncertainty principle, Interpretation of wavefunction and probability density, Postulates of quantum mechanics, Schrodinger's wave equation, Eigenvalues and eigenfunctions, Superposition principle, Particle confined in one-dimensional infinite potential box.	
	PHOTONICS	**(11 Hours)**

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

	Einstein's theory of matter radiation interaction and A & B coefficients, Properties of laser, Spontaneous and stimulated emission, Amplification of light by population inversion, Types of lasers: solid-state laser (Neodymium), gas lasers (CO_2), Optical fiber- principle [TIR] - types-material, mode, refractive index-Fibre Loss-Expression for acceptance angle and numerical aperture, Application-Communication.	
	ELECTROMAGNETISM	**(12 Hours)**
	Overview of electrostatics and magnetostatics – divergence and curl of the electric field, Gauss law and its applications, polarization, Internal field, Clausius-Mossotti relation, Lorentz force, Biot-Savart's law and Ampere's law, Divergence and Curl of Magnetostatic fields, Magnetic materials, Magnetization, Faraday's law, Maxwell's equations, Continuity Equation, Wave solution of Maxwell Equations.	
	Practical's will be based on the coverage of the above topics separately.	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours= 75 Hours)	

3.	**Practical**
1	Radiation correction
2	Prism Angle
3	Magnetic Field of Circular Coil
4	Malus' Law: Polarization of light
5	Stefan's Law
6	Plank's Constant using Photovoltaic Cell
7	Diffraction Grating
8	Newton's Ring

4.	**Books Recommended**
1	C. Kittel, Introduction to Solid State Physics, John-Wiley, 2016.
2	A. Beiser, Concept of the Modern Physics, McGraw-Hill, 2008
3	R. Eisberg and R. Resnick, "Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles", John-Wiley, 2nd Edition, 2006
4	D. J. Griffiths, Introduction to Electrodynamics, Pearson India.
5	R. Resnick and D. Halliday Physics (Part I & II), Wiley 2007.

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
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M.Sc. I (Mathematics) Semester – II FOUNDATION COURSE IN MATHEMATICS-II MA102	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, students will be able to:
CO1	demonstrate an understanding of binary relations, functions, and binary operations, and apply them to solve problems in abstract algebra.
CO2	analyze the fundamentals of group theory and apply the basic concepts to prove theorems on Groups.
CO3	apply the concepts of Cayley's theorem and Cauchy's theorem to prove related results.
CO4	evaluate exponential values of sines, cosines, and hyperbolic functions and to solve problems related to trigonometry
CO5	interpret Gregory's series and Infinite product of sine and cosine.

2.	Syllabus	
	GROUP THEORY-UNIT-I	**(07 Hours)**
	Binary relation, Function, Binary Operation, Groups, Various properties and examples of groups, Subgroups, Properties of subgroups, Normal subgroups and important results, Cyclic groups and their generators, Properties of Cyclic groups.	
	GROUP THEORY- UNIT -II	**(07 Hours)**
	Cosets, Lagrange's theorem, Euler theorem, Fermat's theorem (with proofs), Isomorphism and homomorphism of groups and their examples and results, Quotient group	
	GROUP THEORY- UNIT -III	**(07 Hours)**
	First, Second, and Third Isomorphism Theorems (with proofs), Direct product of groups and their related results.	
	GROUP THEORY- UNIT -IV	**(06 Hours)**
	Permutations, even and odd permutations, transportation, disjoint cycles, permutation groups and theirrelated results, Cayley's theorem, Cauchy's theorem (with proofs)	
	TRIGONOMETRY- UNIT -I	**(10 Hours)**

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	Exponential values of sines, cosines, hyperbolic functions, Inverse circular and hyperbolic functions, and the logarithm of the complex quantities.	
	TRIGONOMETRY- UNIT -II	**(08 Hours)**
	Gregory's series, Summation of series, Infinite product of sine and cosine	
	Tutorials will be based on the coverage of the above topics separately.	(**15 Hours**)
	(Total Contact Time: 45 Hours + 15 Hours=60 Hours)	

3.	**Tutorials**
1	Tutorial will be based on topics: Groups, subgroups, etc.
2	Tutorial will be based on topics: Normal subgroups, cyclic groups, etc.
3	Tutorial will be based on topics: Cosets and Lagrange's theorem.
4	Tutorial will be based on topics: Homomorphism and Isomorphism theorems.
5	Tutorial will be based on topics: Direct products of groups.
6	Tutorial will be based on Cauchy's theorem.
7	Tutorial will be based on circular and hyperbolic trigonometric functions.
8	Tutorial will be based on the logarithm of the complex quantities.
9	Tutorial will be based on Summations of the series.
10	Tutorial will be based on the Infinite product of sine and cosine.

4.	**Books Recommended**
1	N.S. Gopalakrishnan, "University Algebra," New Delhi: New Age International (P) Limited, 2018.
2	J.A. Gallian, "Contemporary Abstract Algebra," 9th ed. Cengage Learning, 2016.
3	J.B. Fraleigh, "First Course in Abstract Algebra," 3rd ed. New Delhi: Narosa Publishing House, 2003.
4	S.L. Loney, "Plane Trigonometry-I," Palala Press, 2016.
5	S.L. Loney, "Plane Trigonometry-II," Palala Press, 2016.

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
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M.Sc. I (Mathematics) Semester – II CALCULUS-II MA104	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, students will be able to:
CO1	demonstrate the knowledge of Successive Differentiation
CO2	analyze and apply concepts of derivatives of multivariable functions.
CO3	plot the curvesin Cartesian, polar, and parametric forms.
CO4	analyze the Fourier series, Fourier Integral, and Fourier transform of a function
CO5	apply the concept of vector calculus to engineering problems

2.	Syllabus	
	DIFFERENTIAL CALCULUS	**(07 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 the application.	
	PARTIAL DIFFERENTIATION	**(10 Hours)**
	Functions of several variables, Limits and continuity, Partial differentiation, Euler's theorem for homogeneous function, Modified Euler's theorem, and Taylor's and Maclaurin's series for two variables. Tangent plane and Normal line, Error and Approximation, Jacobians with properties, Extreme values of a function of two variables, Lagrange's methods of undetermined multipliers	
	CURVE TRACING	**(06 Hours)**
	Envelopes, Concavity, Convexity, Multiple points, Classification of double points, tangents at the origin, Asymptotes (Cartesian and polar form), Curve tracing (Cartesian, polar and parametric forms).	
	FOURIER SERIES	**(07 Hours)**
	Definition, Fourier series with an arbitrary period, particularly periodic function with period 2π. Fourier series of even and odd function, Half range Fourier series.	
	FOURIER INTEGRAL AND FOURIER TRANSFORMS	**(07 Hours)**
	Fourier Integral theorem, Fourier sine and cosine integral complex form of integral, Inversion formula for Fourier transform, Fourier transforms of the derivative of a function.	
	VECTOR CALCULUS	**(08 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,	

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	Green's, Gauss and Stokes theorem (with proofs) & applications.	
	Tutorials will be based on the coverage of the above topics separately.	(**15 Hours**)
	(Total Contact Time: 45 Hours + 15 Hours=60 Hours)	

3.	**Tutorials**
1	Tutorial will be based on Differential Calculus-I
2	Tutorial will be based on Differential Calculus-II
3	Tutorial will be based on Partial Differential Equations-I
4	Tutorial will be based on Partial Differential Equations-II
5	Tutorial will be based on Curve Tracing-I
6	Tutorial will be based on Curve Tracing-II
7	Tutorial will be based on the Fourier Series-I
8	Tutorial will be based on the Fourier Series-I
9	Tutorial will be based on the Fourier Integral and Transformation.
10	Tutorial will be based on Vector Calculus.

4.	**Books Recommended**
1	J. Stewart, "Calculus," Thomson Asia, Singapore, 2003.
2	P. O'Neil, "Advanced Engineering Mathematics," Thompson, Singapore, Ind. Ed. 2002.
3	E. Kreyszing, "Advanced Engineering Mathematics," John Wiley & Sons, Singapore, Int. Student Ed. 2015.
4	C. R. Wiley, "Advanced Engineering Mathematics," McGraw Hill Inc., New York Ed. 1993.
5	F. B. Hildebrand, "Methods of Applied Mathematics," PHI, New Delhi, 1968.
	Additional Reference Books
1	B. V. Ramana, "Higher Engineering Mathematics", The McGraw-Hill Inc., New Delhi, 2007.
2	S. Pal and S. C. Bhunia, "Engineering Mathematics", Oxford University Press, New Delhi, 2015.
3	Bali and Iyengar, "Engineering Mathematics," Laxmi Publications, New Delhi, 2004.

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
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M.Sc. I (Mathematics) Semester – II PYTHON PROGRAMMING MA132	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, students will be able to:
CO1	learn the basics of programming using Python
CO2	familiarize with object-oriented programming concepts
CO3	use different Python Libraries
CO4	write code using functions, files, and exception handling
CO5	implement Python to mathematics and computer science problems

2.	Syllabus	
	INTRODUCTION TO PYTHON, DATA TYPES, CONTROL STRUCTURES, DATA ANALYSIS &VISUALIZATION	**(12 Hours)**
	Overview of programming and programming languages, Introduction to Python programming, Features of Python, Python installation and setup, Python IDLE and basic operations, Writing and executing Python programs, Variables and data types (integers, floats, strings, Booleans), Basic operations (arithmetic, comparison, logical), Input/output operations (print (), input()), Conditional statements (if, elif, else), Looping constructs (for, while), Break, continue, and pass statements, Introduction to popular Python libraries (e.g., NumPy, Pandas, Matplotlib), Introduction to data analysis and visualization in Python, working with data using Python libraries (e.g., Pandas, Matplotlib).	
	FUNCTIONS AND OBJECT-ORIENTED PROGRAMMING	**(06 Hours)**
	Defining and calling functions, Function parameters and return values, Scope and lifetime of variables, Introduction to object-oriented programming (OOP), Classes and objects in Python, Constructors and destructors, Inheritance, and polymorphism.	
	FILE HANDLING, EXCEPTION HANDLING, AND INTRODUCTION TO ML & AL	**(05 Hours)**
	Opening, reading, and writing text and binary files, File modes and file objects, Exception handling using try, except, else, and finally, handling specific exceptions, Introduction to machine	

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	learning and its applications, Introduction to popular Python libraries for machine learning (e.g., scikit-learn, TensorFlow).	
	APPLICATIONS OF PYTHON IN COMPUTATIONAL ALGEBRA	**(08 Hours)**
	Basic mathematical operations using Python, working with math libraries (e.g., math, random), Solving for x; Expanding terms; Creating and accessing Matrices using Sympy and Numpy; Prime factorization; Solving inequalities; Summation and Products; Algebra of polynomials; Finding roots of polynomials; Complex numbers; Logarithm properties; Arithmetic sequences; Geometric sequences; Maxima and minima of functions; Even and odd functions.	
	PYTHON FOR TRIGONOMETRY AND CALCULUS	**(08 Hours)**
	Plotting random phase angles; converting angles and radians; plotting curves of trigonometric functions; Calculus – computing limits of a function, derivatives of functions, plotting tangent lines, finding critical points; partial derivatives; Indefinite integrals; definite integrals; the area between curves; First-order and second-order ordinary differential equations.	
	ADVANCED APPLICATIONS OF PYTHON IN LINEAR ALGEBRA AND STATISTICS	**(06 Hours)**
	Row and column vectors; algebra of vectors – dot product, adding, scalar multiplication; Matrix multiplication; Matrix inverse; solving system of linear equations; Eigenvalues and Eigenvectors. Graphical presentation of data; Measure of central tendency – Mean, Median and Mode, Variance, and standard deviation.	
	Practical's will be based on the coverage of the above topics separately.	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours=75 Hours)	

3.	**Practical**
1	Program to calculate the sum and average of a list of numbers using functions.
2	Program to read data from a CSV file using the Pandas library and perform data analysis.
3	Program to plot a sine wave and cosine wave using Matplotlib.
4	Program to perform basic arithmetic operations (addition, subtraction, multiplication, division) using functions.
5	Program to create a class representing a student and calculate their grades based on certain criteria.
6	Program to create a class representing a graph and perform basic operations like adding nodes, edges,
7	Program to handle exceptions while reading a file and display appropriate error messages.
8	Program to implement linear regression using the scikit-learn library for a given dataset.

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9	Program to calculate the roots of a quadratic equation using the math library.
10	Program to generate a random matrix using the NumPy library and perform matrix multiplication.
11	Program to compute the derivative of a given function using symbolic mathematics with SymPy.
12	Program to calculate the definite integral of a function using numerical integration methods from
13	Program to calculate the mean, median, and mode of a list of numbers using NumPy and statistics.
14	Program to solve a system of linear equations using NumPy.
15	Program to calculate the eigenvalues and eigenvectors of a matrix using NumPy.

4.	**Books Recommended**
1	Timothy A Budd, "Exploring Python", Tata McGraw Hill, New Delhi. Michel Dawson, "Python Programming for Absolute Beginners", Third Edition, Course Technology Cengage Learning Publications, 2013.
2	Allen B. Downey, Think Python: How to Think Like a Computer Scientist, second edition, O'Reilly Media, Inc, 2015.
3	Bill Lubanovic , Introducing Python, O'Reilly Media, Inc. 2nd Edition, November 2019.
4	Amit Saha, Doing Math with Python Use Programming to Explore Algebra, Statistics, Calculus, and More, No Starch Press, 2015.
5	Robert Johansson, Numerical Python: Scientific Computing and Data Science Applications with NumPy, SciPy, and matplotlib, Apress,2018.
6	David A. Ham , Object-oriented Programming in Python for Mathematicians Paperback, 2023.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
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M.Sc. I (Mathematics) Semester – II FUNDAMENTALS OF PHYSICS-II PH106	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, students will be able to:
CO1	interpret the dielectrics and polarization and their applications in electrostatics
CO2	explain magnetization in materials and magnetic fields in matter
CO3	analyze the magnetization in materials and their applications
CO4	explain the fundamentals of thermodynamics laws and thermodynamic processes
CO5	demonstrate the basis of the theory of relativity

2	Syllabus	
	ELECTRIC FIELDS IN MATTER	**(09 Hours)**
	Conductors, Dielectrics, Polarization, The field of Polarized object, The electric displacement, Boundary Conditions, Conduction, and convection currents, Ohm's law	
	BOUNDARY VALUE PROBLEMS	**(09 Hours)**
	Laplace equation in one, two, and three-dimensions, 1st and 2nd uniqueness theorem, Classic image problem, Induced surface charge, Force and energy, other image problems, Separation of variables, Multipole expansion	
	MAGNETIC FIELDS IN MATTER	**(09 Hours)**
	Magnetization in materials, The field of a magnetized object, The auxiliary field H, Linear and non-linear media, Magnetic boundary conditions.	
	THERMODYNAMICS	**(08 Hours)**
	Zeroth law of Thermodynamics, 1st and 2nd laws of Thermodynamics, Concepts of temperature, Internal energy and entropy, Calculations of change of internal energy and entropy in various thermodynamic processes.	

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	THEORY OF RELATIVITY	**(10 Hours)**
	Problems with Classical Physics, Postulates of Special Theory of Relativity, Principles of Relativity, Length contraction, Time dilation, Lorentz transformations, Mass-Energy equivalence, and Doppler effect in special relativity.	
	Practicals will be based on the coverage of the above topics separately.	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours=75 Hours)	

3.	**Practical**
1	Wheatstone Bridge
2	Melde's Experiment
3	Decay Constant/ Probability
4	Carey Foster Bridge
5	Magnetic Field of Earth
6	Vibrational and Deflection Magnetometer
7	Two Bean Interference by Fresenl Bi Prism and Fresenl Mirror
8	Michelson Interferometer
9	Fabery Perot Etalon
10	Sonometer

4.	**Books Recommended**
1	M. N. O. Sadiku, Elements of Electromagnetics, Oxford University Press, 2003.
2	J. D. Jackson, Classical Electrodynamics, Wiley,2012.
3	Mark Zemansky, Richard Dittman, Heat and Thermodynamics, McGraw Hill Education,2017.
4	D. J. Griffiths, Introduction to electrodynamics, Prentice-Hall of India Private Limited, 2015
5	A. Beiser, S. Mahajan and S. R. Choudhary, Concepts of Modern Physics, McGraw Hill Education, 2015.

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
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M.Sc. I (Mathematics) Semester – II CHEMISTRY CY112	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, students will be able to:
CO1	acquaint with the properties of water and its treatment processes
CO2	understand the basic of corrosion chemistry to protect various metals
CO3	discuss about polymers and their applications
CO4	acquire knowledge on synthesis and applications of different materials
CO5	learn fundamental knowledge on dyes and drugs.

2	Syllabus	
	WATER	**(09 Hours)**
	Structure of water, physical and chemical properties, Hydrogen bonding, Specifications for water in industries, types of water (raw water, cooling water, boiler water, nuclear water), Hardness of water, Estimation, and units of Hardness, Boiler feed water, Boiler Problems - Scales & Sludge, Priming, Foaming, Carryover, Caustic Embrittlement, Boiler corrosion, Desalination. Water softening (lime-soda, zeolite and ion-exchange) methods.	
	POLYMER	**(07 Hours)**
	Introduction of Polymers: Classification of polymers, nomenclature, functionality in polymers, number and weight average molecular weight, molecular weight distribution (PDI), Chain Architecture (Linear/Branched, Tacticity, Isomerism), homopolymers, copolymers, graft copolymers, and their characteristic properties in reference to their applications. Types of polymerizations: addition, condensation, chain growth, and step growth. Polymerization techniques: bulk, suspension, and emulsion polymerization. Molding constituents of Polymer, Molding (Injection, Extrusion and Compressing) methods.	
	CHEMISTRY OF MATERIALS	**(09 Hours)**
	Alloys: Introduction, Necessity of making alloys, classification, Metal-Metal alloy: Brass (properties and applications), Metal-Non-metal alloy: Steel (properties), Composites: Introduction, classification, particulate composites, structural composites (Laminar and Sandwich), Advantages and applications of Composites, Nanomaterials – properties synthesis (sol-gel) and applications, Basics of Green Chemistry.	
	INSTRUMENTAL TECHNIQUES	**(06 Hours)**
	Theoretical and Experimental: Conductometry, Colorimetry, Potentiometry, pH-metry.	
	DYES AND DRUGS	**(09 Hours)**
	Introduction to Dyes: Sources and classification of dyes (chemical composition and applications), Requirements for a true dye, Witt's theory, Mode of application, Mechanisms of dyeing; Thermodynamics of dyeing; Kinetics of dyeing; Dye-fibre interactions; Role of fiber structure in dyeing.	

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	Introduction to Drugs: Sources and classification of drugs, the requirement for an ideal drug, routes of administration, pharmaceutical phase, pharmacokinetic phase, the bioavailability of a drug and pharmacodynamics phase, Examples of Drug Action: Concept of antibiotics, Structure, and activity of Penicillin, Properties and synthesis of Vitamin-C.	
	CORROSION AND ITS CONTROL	**(05 Hours)**
	Introduction, types, and mechanism of (Chemical and Electrochemical) corrosion, Types of Electrochemical corrosion (Galvanic, Pitting, Crevice), Passivity, Galvanic series, Factors influencing corrosion, Protective measures against corrosion: (i) Modification of the environment(ii) Modification of the properties of the Metal (iii) Prevention of corrosion by Materials selection and Design (iv) Other corrosion prevention methods.	
	Practicals will be based on the coverage of the above topics separately.	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours=75 Hours)	

3.	**Practical**
1.	Potentiometric redox titration of Fe^{2+} against standard Ce^{4+} solution.
2.	pH-metric titration of acidic water with a standard base.
3.	iodometric determination of Cu in Brass sample.
4.	Complexometric determination of water hardness.
5.	Trimetric determination of l-Ascorbic acid (Vitamin-C).
6.	Estimation of chemical oxygen demand (COD) in wastewater.
7.	Determination of dissolved oxygen (DO) in wastewater.
8.	Conductometric titration to determine the strength of strong acid with strong base
9.	Electrode deposition study of Cu.
10.	Concentration determination of Co as a pollutant using spectrophotometry.

4.	**Books Recommended**
1	P.C. Jain and M. Jain, "Engg. Chemistry," 15th ed. Dhanpat Rai Publishing Co., New Delhi, 2006.
2	S. Chawla, "A Textbook of Engineering Chemistry," latest ed. Dhanpat Rai & Co., 2015.
3	S. K. Tripathy, A.K. Pandhy, and A.K. Panda, "Material Science & Engineering," 2nd ed. Scitech Publications (India) Pvt. Ltd., 2009.
4	A.I. Vogel and J. Mendham, "Vogel's Textbook of Quantitative Chemical Analysis," 6th ed. Hall, 2002.
5	B. K. Sharma, "Engg. Chemistry," KrishnaPrakashan Media (P) Ltd, 2008.

Subject Code:##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4)EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Mathematics
Five Years Integrated M.Sc. Mathematics

B.Tech.1 /M.Sc. 1 Semester I/ II INDIAN VALUE SYSTEM AND SOCIAL CONSCIOUSNESS HS120	Scheme	L	T	P	Credit
		2	0	0	02

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	interpret the important values that need to be cultivated
CO2	analyse the cultures depicted in Ramayana, Mahabharata, Jainism and Buddhism
CO3	review the structure of Indian knowledge system
CO4	discuss the significance of constitution of India
CO5	demonstrate social responsibility

2.	Syllabus	
	HUMAN VALUES AND CONSCIOUSNESS	**(08 Hours)**
	Human Values Definition and Classification of Values; The Problem of Hierarchy of Values and their Choice; Self-Exploration; 'Basic Human Aspirations; Right understanding, Relationship and Physical Facility; fulfilment of aspirations; Understanding Happiness and Prosperity, Harmony at various levels. What Is Consciousness? ; Can We Build A Conscious Machine?; Levels Of Consciousness; Mind, Matter And Beyond; Holistic Lifestyle; Dealing With Anxiety; Connecting Mind To Brain; Minds, Brains, And Programs.	
	INDIAN CULTURE AND HERITAGE	**(07 Hours)**
	Culture and its salient features: The Vedic – Upanishadic Culture and society, Human aspirations in those societies; Culture in Ramayana and Mahabharata: The Ideal Man and Woman, Concepts Maitri, Karuna, Seela, Vinaya, Kshama, Santi, Anuraga – as exemplified in the stories and anecdotes of the Epics; The Culture of Jainism: Jaina conception of Soul, Karma and liberation, Buddhism as a Humanistic culture; The four Noble truths of Buddhism; Vedanta and Indian Culture;	
	INDIAN KNOWLEDGE SYSTEM	**(08 Hours)**
	Indian knowledge as a unique system, Place of Indian knowledge in mankind's evolution, Relevance of Indian knowledge to present day and future of mankind, Nature of Indian Knowledge; Structure of Indian Knowledge: Types of knowledge (para, apara), The scientific and the unscientific, Instruments for gaining and verifying knowledge, Knowledge traditions: Lineages, Instruments - debate, epistemology and pedagogy, The inverted tree – axiomatic, deductive, empirical knowledge, and evolution of knowledge; Disciplines of Study: A brief outline of the subjects, the major contributions and theories along with timelines where	

	relevant: Mathematics; Astronomy; Physical Sciences; Cosmogony; Language studies; Astrology; Moral studies/righteousness; Statecraft and political philosophy	
	INDIAN CONSTITUTION	**(04 hours)**
	History of Making of the Indian Constitution; Philosophy of the Indian Constitution: Preamble; Salient Features; Contours of Constitutional Rights & Duties; Organs of Governance: Parliament; Composition; Qualifications and Disqualifications; Powers and Functions	
	SOCIAL RESPONSIBILITY	**(03 Hours)**
	Social Responsibility: Meaning and Importance, Different Approaches of Social Responsibility. Social Responsibility of Business towards different Stakeholders. Evolution and Legislation of CSR in India.	
	(Total Contact Time: 30 Hours)	

3.	**Books Recommended**
1	D. K. Chaturvedi, Professional Ethics Values and Consciousness, Ane Books Pvt. Ltd., 2023.
2	R.R. Gaur, R Sangal, G. P.Bagaria, Human Values and Professional Ethics, Excel Books, New Delhi, 2010.
3	A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.
4	P R Rao, Indian Heritage and Culture, Sterling Publishers Pvt. Ltd, 1988.
5	D. Singh, Indian Heritage and Culture, APH Publishing Corporation, 1998.
6	Sri Prashant Pole, Treasure Trove of Indian knowledge, Prabhat Prakashan, 2021.
7	Sri Suresh Soni, Sources of our cultural heritage, Prabhat Prakashan, 2018.
8	D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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