Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Mathematics
Bachelor of Technology in Mathematics and Computing (MaC)

Sr. No.	Subject	Code	Scheme L-T-P	Credits (Min.)	Notional hours of Learning (Approx.)
	First Semester (1st year of B.Tech. MaC)				
1	Foundation Course in Mathematics	MA125	3-1-0	4	70
2	Calculus	MA127	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	Engineering Physics	EP109	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)a
	Second Semester (1st year of B.Tech. MaC)				
1	Foundation Course in Algebra	MA122	3-1-0	4	70
2	Advanced Calculus	MA124	3-1-0	4	70
3	Fundamentals of Python Programming	MA134	3-0-2	4	85
4	Digital Electronics and Logic Design	EC106	3-0-2	4	85
5	Probability and Statistics	MA136	3-1-0	4	70
6	Indian Value System and Social Consciousness	HU120	2-0-0	2	35
			Total	**22**	**415**
7	Vocational Training / Professional Experience (Optional) (mandatory for exit)	MAV02 / MAP02	0-0-10	5	200 (20 x 10)
	Third Semester (2nd year of B.Tech. MaC)				
1	Element of Analysis	MA201	3-1-0	4	70
2	Discrete Mathematics for Computing	MA207	3-1-0	4	70
3	Data Structure and algorithm	MA233	3-0-2	4	85
4	Elective-I	MA2AA	3-0-1/ 3-0-2	4	70/85
5	Database Management System	MA235	3-0-2	4	85
			Total	**20**	**380/395**
	Fourth Semester (2nd year of B.Tech. MaC)				
1	Numerical Analysis	MA202	3-1-0	4	70
2	Computational Linear Algebra	MA206	3-1-0	4	70
3	Elementary Number theory	MA234	3-1-0	4	70
4	Elective-II	MA2BB	3-0-1/ 3-0-2	4	70/85
5	Design and Analysis of Algorithms	MA236	3-0-2	4	85
			Total	**20**	**365/380**
6	Mathematical Software-II/ Mini project-I Vocational Training / Professional Experience (Optional) (mandatory for exit)	MAV04 / MAP04	0-0-10	5	200 (20 x 10)

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	Fifth Semester (3rd year of B.Tech. MaC)				
1	Ordinary Differential Equations and computations	MA305	3-0-2	4	85
2	Foundation of Data Science	MA307	3-1-0	4	70
3	Machine Learning	MA334	3-0-2	4	85
4	Elective-III (Open Elective)	MA3AA	3-1-0 3-0-2	4	70/85
5	Elective-IV (Specialization#1)	MA3BB	3-X-X	4	70/85
6	MOOC Course*		3-0-0/ 3-1-0	3/4	70/85
			Total	**20**	**380-410**
	Sixth Semester (3rd year of B.Tech. MaC)				
1	Optimization Techniques and Computing	MA306	3-0-2	4	85
2	Partial Differential Equation and Computing	MA308	3-0-2	4	85
3	Fundamentals Artificial Intelligence	CS300	3-1-0	4	70
4	Elective-V (Open Elective)	MA3CC	3-1-0 3-2-0	4	70/85
5	Elective-VI (Specialization#2)	MA3DD	3-X-X	4	70/85
6	MOOC Course*		3-0-0/ 3-1-0	3/4	70/85
			Total	**20**	**450-495**
7	Mini Project-II/ Vocational Training / Professional Experience (Optional) (mandatory for exit)	MAV06 / MAP06	0-0-10	5	200 (20 x 10)
	Seventh Semester (4th year of B.Tech. MaC)				
1	Topology and Functional Analysis	MA407	3-1-0	4	70
2	Elective-VII	MA4AA	3-1-0 3-0-2	4	70/85
3	Elective-VIII	MA4BB	3-1-0 3-0-2	4	70/85
4	Elective-IX (Specialization#3)	MA4CC	3-X-X	4	70/85
5	Elective-X (Specialization#4)	MA/CS/AI4DD	3-X-X	4	70/85
			Total	**20**	**350-410**
6	Mini Project-III/ Vocational Training / Professional Experience (Optional) (mandatory for exit)	MAV07 / MAP07	0-0-10	5	200 (20 X 10)
	Eighth Semester (4th year of B.Tech. MaC)				
1	Industrial Internship / Professional Experience (Mandatory)	MA404	0-0-40	20	800 (40 X 20)
			Total	**20**	**800**

*Students will be required to opt any one Massive Open Online Courses (MOOC) course through NPTEL / SWAYAM platform in Either Semester -V or Semester- VI excluding the courses of the existing curriculum of B.Tech. in Mathematics and Computing programme. Necessary approval from the

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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.

Sr. No.	Optional Core	Code	Scheme L-T-P
1	Computer Programming using C/C++	MA131	3-0-2
2	Fundamental of Python Programming	MA134	3-0-2
3	Probability and Statistics	MA136	3-1-0
4	Data Structure and Algorithm	MA233	3-0-2
5	Database Management System	MA235	3-0-2
6	Elementary Number theory	MA232	3-1-0
7	Design and Analysis of Algorithms	MA236	3-0-2
8	Machine Learning	MA334	3-0-2
9	Fundamentals of Artificial Intelligence	CS300	3-1-0

Sr. No.	Elective	Code	Scheme L-T-P
	Elective-I		
1	Analytical Geometry	MA251	3-1-0
2	Object Oriented Programming	MA252	3-1-0
	Elective-II		
3	Computer Networks	CS208	3-0-2
4	Computational Life Science	MA253	3-1-0
	Elective-III & IV		
5	Advanced Mathematical Methods-I	MA351	3-1-0
6	Stochastic Differential equation and computation	MA358	3-0-2
7	Financial Mathematics and computation	MA359	3-0-2
8	Fourier Analysis	MA361	3-1-0
9	Cryptography	MA362	3-0-2
10	Mathematical Modelling and computation	MA363	3-1-0
11	Data Visualization	MA364	3-0-2
	Elective-V & VI		
12	Integral and Wavelet Transform	MA365	3-1-0
13	Theory of Computation	MA366	3-1-0
14	Information Theory and Coding	MA367	3-1-0
15	Soft Computing	MA368	3-0-2
16	Operating Systems	MA369	3-0-2
17	Advanced Evolutionary Algorithms	MA370	3-0-2
18	Block Chain Technology	CS360	3-1-0
19	High Performance Computing	MA371	3-1-0
20	Professional Ethics, Economics, and Business Management	MG210	3-1-0

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	Elective-VII to Elective-X		
21	Advanced Mathematical Methods-II	MA452	3-1-0
22	Data Analytics	MA453	3-0-2
22	Multi Objective Optimization	MA454	3-1-0
23	Evolutionary Algorithms	MA455	3-1-0
24	Fuzzy Logic and Computation	MA456	3-1-0
25	Computational Fluid Dynamics	MA457	3-0-2
26	Natural Language Processing	MA4XX/CS461/AI4XX	3-0-2
27	Image Processing and Mining	MA460/CS/AI4XX	3-0-2
28	Deep Learning	MA461/CS/AI4XX	3-0-2
29	Computational Finance and Financial Econometrics	MA462	3-1-0
30	Measure Theory and Integration	MA463	3-1-0
31	Advanced Mathematical and Simulation Modelling	MA464	3-0-2
32	Uncertainty theory and Computation	MA465	3-0-2
33	Foundations of Robotics	MA466/CS/AI4XXX	3-1-0
34	Innovation, Incubation and Entrepreneurship	MG110	3-1-0
35	Neural Network	MA467	3-0-2
36	Automata Theory	MA468	3-1-0
37	Quantum Computing	MA469	3-0-2
38	Finite Element Methods and Computations	MA471	3-0-2
39	Error Correcting Codes	MA473	3-0-2
40	Cloud Computing	MA470/CS/AI4XXX	3-0-2
41	Complex Analysis	MA475	3-1-0
42	Hybrid Algorithms	MA476	3-0-2
43	Reinforcement Learning	MA474/CS/AI4XXX	3-0-2
44	Financial Instruments and Risk Management	MA477	3-1-0
45	Advanced Operations Research	MA478	3-1-0
46	Computational Fluid Dynamics in Porous Media	MA479	3-1-0
47	Advanced Numerical Analysis and computation	MA480	3-0-2
48	Nonlinear and Robust Control Optimization	MA481	3-1-0
49	Theoretical and Computational Neuroscience	MA482	3-1-0
50	Stochastic Finance	MA483	3-1-0
51	Computational Heat and Mass Transfer	MA484	3-0-2

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Mathematics
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B.Tech. MaC - I, Semester – I FOUNDATION COURSE IN MATHEMATICS MA125	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 the knowledge of functions and relations on sets.
CO3	demonstrate the knowledge of POSET, GLB, LUB, Hasse diagrams.
CO4	determine the convergence and divergence of sequence and series.
CO5	Interpret the 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 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.	

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	Valuable Contribution of Indian Scientist/ Mathematician	
	Mādhava of Sangamagrāma (1340–1425): trigonometric functions (sine, cosine, and arctangent), infinite series expansion for π / 4 **Jyeshtadeva** (1500 CE): Properties of Sine, Cosine and Inverse tangent series, Indeterminate equation using Calculus technique **Bhaskara-I:** (600-680):Approximation Formula for the Sin function in improving trigonometric calculation **Shridhara** (650-850): Concept of the Integral Calculus	
	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, McGraw Hill, New York, NY, 2023.
2	S.C. Malik and Savita Arora, Mathematical Analysis, New Age International (P) Limited, New Delhi, India, 2021.
3	T. Apostol, Mathematical Analysis, Narosa Publishers, India, 2002.
4	H. L. Royden, Real Analysis, Macmillan Publishing Co. Inc., New York, NY, 2021.
5	N.S. Gopalakrishnan, University Algebra, New Age International (P) Limited, New Delhi, India, 2018.

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B.Tech. MaC - I, Semester – I CALCULUS MA127	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)**
	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)**

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	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. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, Singapore, International Student Edition, 2015.
2	J. S. De, "Calculus", Thomson Asia, Singapore, 2016.
3	P. O'Neel, "Advanced Engineering Mathematics", Thompson, Singapore, Indian Edition, 2012.
4	B. V. Ramana, "Higher Engineering Mathematics", The McGraw-Hill Inc., New Delhi, 2017.
5	G. B. Thomas, J. Hass , C. Heil, M. D. Weir, “Thomas’ Calculus, Pearson Education, 2018.
	Additional Reference Books
1	G. E. Hay, "Vector and Tensor Analysis", Dover Publications, 2012.
2	S. Pal and S. C. Bhunia, "Engineering Mathematics", Oxford University Press, New Delhi, 2015.
3	M. L. Boas, "Mathematical Methods in the Physical Sciences", John Wiley & Sons, Edition 2005.
4	J. N. Kapur, "Mathematical Models in Biology and Medicine", East West Press, New Delhi, 2019.

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
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Bachelor of Technology in Mathematics and Computing (MaC)

B.Tech. MaC - I, 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	utilizing 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 Ports.	
	C++ PROGRAMMING: INTRODUCTION	**(12 Hours)**

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	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	E. Balagurusamy, “Programming in ANSI C”, 8/E, Tata Mc-Graw Hill, 2019.
3	Pradip Dey, “Programming in C”, 2/E, Oxford University Press, 2012.
4	Robert Lafore, “Object-Oriented Programming in C++”, 4th Ed. SAMS, Indianapolis, Indiana, USA, 2002.
5	YashavantKanetkar, “Let Us C++”, BPB Publications, 19TH Edition India, 2020.

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B.Tech. MaC - I, 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)
	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)	

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)

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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 2021.
4	Courtland L. Bovee, John V. Thill, and Mukesh Chaturvedi. "Business Communication Today." Ninth Edition. Pearson, 2018.
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, 2021.

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B.Tech. MaC - I, Semester – I ENGINEERING PHYSICS EP109	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)**
	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,	

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)

	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, 2019.
2	A. Beiser, Concept of the Modern Physics, McGraw-Hill, 2017.
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, 2020.
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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B.Tech. MaC - I, Semester – II FOUNDATION COURSE IN ALGEBRA MA122	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	analyze the systems of linear equations and find their solutions.
CO5	handle linear modelling problems through matrix algebra.

2.	Syllabus	
	GROUP THEORY-UNIT-I	**(06 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	**(06 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	**(06 Hours)**
	First, Second, and Third Isomorphism Theorems (with proofs), Direct product of groups and their related results.	
	GROUP THEORY- UNIT -IV	**(05 Hours)**
	Permutations, even and odd permutations, transportation, disjoint cycles, permutation groups and the irrelated results, Cayley's theorem, Cauchy's theorem (with proofs)	
	LINEAR ALGEBRA - UNIT -I	**(07 Hours)**
	Matrix theory, determinants and their application to systems of linear equations, row reduction and echelon forms, vector equations, solution sets of linear systems, applications of linear systems, linear independence.	
	LINEAR ALGEBRA - UNIT -II	**(07 Hours)**

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	Rank of a matrix, Eigen values, Eigen vectors and characteristic equation of a matrix. Cayley-Hamilton theorem and its use in finding the inverse of a matrix.	
	LINEAR ALGEBRA - UNIT -III	**(08 Hours)**
	Definition of vector space of R^n, introduction to linear transformations, matrix of a linear transformation, inverse of a matrix, characterizations of invertible matrices. Subspaces of R^n, dimension of subspaces of R^n.	(**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, Cayley's theorem.
7	Tutorial will be based on matrix and determinant.
8	Tutorial will be based on systems of linear equations.
9	Tutorial will be based on Eigen values and Eigen vectors of matrix.
10	Tutorial will be based on vector space and linear transformations.

4.	**Books Recommended**
1	N. S. Gopalakrishnan, University Algebra, New Age International (P) Limited, New Delhi, 2018.
2	J. A. Gallian, Contemporary Abstract Algebra, 10th ed., Cengage Learning, 2020.
3	J. B. Fraleigh, First Course in Abstract Algebra, 8th ed., Narosa Publishing House, New Delhi, 2022.
4	D. C. Lay, Linear Algebra and its Applications, 6th ed., Pearson Education, 2021.
5	K. Hoffman and R. Kunze, Linear algebra, 2nd ed., Pearson Education, 2018.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
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B.Tech. MaC -I, Semester – II ADVANCED CALCULUS MA120	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 curves in 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, Green's, Gauss and Stokes theorem (with proofs) & applications.	
	Valuable Contribution of Indian Scientist/ Mathematician	

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	Historical development of calculus from ancient India to the modern era: mathematical ideas of Aryabhata (476–550 CE), including numerical approximation and interpolation; contributions of Brahmagupta (598–668 CE) to algebraic methods and computational mathematics; Bhāskara II (1114–1185 CE) and his concepts related to instantaneous motion, maxima and minima, and differential ideas; the Kerala School of Astronomy and Mathematics (14th–16th centuries) led by Madhava of Sangamagrama, including infinite series expansions for trigonometric functions, convergence, error estimation, and their further development by Parameśvara, Nīlakaṇṭha Somayaji, and Jyeṣṭhadeva in the *Yuktibhāṣā*; contributions of modern Indian mathematicians, particularly Srinivasa Ramanujan, to infinite series, special functions, mathematical analysis, and their relevance to advanced calculus.	
	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, 8th Edition, 2016.
2	P. O'Neil, "Advanced Engineering Mathematics," Thompson, Singapore, Ind. Ed. 2012.
3	E. Kreyszig, "Advanced Engineering Mathematics," John Wiley & Sons, Singapore, Int. Student Ed. 2015.
4	B. V. Ramana, "Higher Engineering Mathematics", The McGraw-Hill Inc., New Delhi, 2017.
5	G. B. Thomas, J. Hass , C. Heil, M. D. Weir, "Thomas' Calculus, Pearson Education, 2018.
	Additional Reference Books
1	S. Pal and S. C. Bhunia, "Engineering Mathematics", Oxford University Press, New Delhi, 2015.
2	Bali and Iyengar, "Engineering Mathematics," Laxmi Publications, New Delhi, 2016.

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
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Bachelor of Technology in Mathematics and Computing (MaC)

B.Tech. MaC - I, Semester – II FUNDAMENTAL OF PYTHON PROGRAMMING MA134	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 learning	

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)

	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
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.
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.

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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 SciPy.
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, 2011.
	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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B.Tech. MaC - I, Semester – II DIGITAL ELECTRONICS AND LOGIC DESIGN EC106	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	acquire knowledge about different types of diodes and circuits.
CO2	apply the knowledge of gates, Boolean algebra and operational amplifier in designing logical and integrated circuits.
CO3	analyse the logical, integrated, and operational amplifier based circuits.
CO4	evaluate the different circuits and compare their performance.
CO5	design ALU and control unit.

2.	Syllabus	
	PN DIODE AND TRANSITOR	**(07 Hours)**
	PN Diode Theory, PN Characteristic and Breakdown Region, PN Diode Application as Rectifier, Zener Diode Theory, Zener Voltage Regulator, Diode as Clamper and Clipper, Photodiode Theory, LED Theory, 7 Segment LED Circuit Diagram and Multi Colour LED, LASER Diode Theory and Applications, Bipolar Junction Transistor Theory, Transistor Symbols And Terminals, Common Collector, Emitter and Base Configurations, Different Biasing Techniques, Concept of Transistor Amplifier, Introduction to FET Transistor And Its Feature.	
	WAVESHAPING CIRCUITS AND OPERATIONAL AMPLIFIER	**(06 Hours)**
	Linear Wave Shaping Circuits, RC High Pass and Low Pass Circuits, RC Integrator and Differentiator Circuits, Nonlinear Wave Shaping Circuits, Two Level Diode Clipper Circuits, Clamping Circuits, Operational Amplifier OP-AMP with Block Diagram, Schematic Symbol of OP-AMP, 741 Package Style and Pinouts, Specifications of Op-Amp, Inverting and Non-Inverting Amplifier, Voltage Follower Circuit, Multistage OP-AMP Circuit, OP-AMP Averaging Amplifier, OP-AMP Subtractor.	
	BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS	**(04 Hours)**
	Basic Logic Operation and Logic Gates, Truth Table, Basic Postulates and Fundamental Theorems of Boolean Algebra, Standard Representations of Logic Functions- SOP and POS Forms, Simplification of Switching Functions-K-Map and Quine-Mccluskey Tabular Methods, Synthesis of Combinational Logic Circuits.	
	COMBINATIONAL LOGIC CIRCUIT USING MSI INTEGRATED CIRCUITS	**(07 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)

	Binary Parallel Adder; BCD Adder; Encoder, Priority Encoder, Decoder; Multiplexer and Demultiplexer Circuits; Implementation of Boolean Functions Using Decoder and Multiplexer; Arithmetic and Logic Unit; BCD to 7-Segment Decoder; Common Anode and Common Cathode 7-Segment Displays; Random Access Memory, Read Only Memory and Erasable Programmable ROMS; Programmable Logic Array (PLA) and Programmable Array Logic (PAL).	
	INTRODUCTION TO SEQUENTIAL LOGIC CIRCUITS	**(04 Hours)**
	Basic Concepts of Sequential Circuits; Cross Coupled SR Flip-Flop Using NAND or NOR Gates; JK Flip-Flop Rise Condition; Clocked Flip-Flop; D-Type and Toggle Flip-Flops; Truth Tables and Excitation Tables for Flip-Flops; Master Slave Configuration; Edge Triggered and Level Triggered Flip-Flops; Elimination of Switch Bounce using Flip-Flops; Flip-Flops with Preset and Clear.	
	SEQUENTIAL LOGIC CIRCUIT DESIGN	**(06 Hours)**
	Basic Concepts of Counters and Registers; Binary Counters; BCD Counters; Up Down Counter; Johnson Counter, Module-N Counter; Design of Counter Using State Diagrams and Table; Sequence Generators; Shift Left and Right Register; Registers with Parallel Load; Serial-In-Parallel-Out (SIPO) And Parallel-In-Serial-Out (PISO); Register using Different Type of Flip-Flop.	
	REGISTER TRANSFER LOGIC	**(04 Hours)**
	Arithmetic, Logic and Shift Micro-Operation; Conditional Control Statements; Fixed-Point and Floating-Point Data; Arithmetic Shifts; Instruction Code and Design Of Simple Computer.	
	PROCESSOR LOGIC DESIGN	**(03 Hours)**
	Processor Organization; Design of Arithmetic Logic Unit; Design of Accumulator.	
	CONTROL LOGIC DESIGN	**(04 Hours)**
	Control Organization; Hard-Wired Control; Micro Program Control; Control Of Processor Unit; PLA Control.	
	Practicals will be based on the coverage of the above topics separately.	**(28 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	**Practicals**
1	Study of BJT Characteristics
2	Study of CE Amplifier
3	Study of RC Coupled / Tuned Amplifier
4	Study of FET Characteristics
5	Study of Diode Clipper Circuits
6	Study of Diode Clamper Circuits

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7	Study and Implement RC Low Pass and High Pass Filter Circuits
8	Study and Implement RC Integrator Circuits
9	Study and Implement RC Differentiator Circuits
10	Full and Half-Adder/ Half-subtarctor Circuits using a serial Input
11	4-Bit Gray to Binary/ Binary to Gray Code convertor using Select input
12	Logic expression with the Help of MUX IC 74153
13	Flip-flops using NAND/ NOR Gate
14	Modulo-7 Ripple Counter
15	4-Bit Shift Left/Right Register
16	Sequence Generator

4.	**Books Recommended**
1	Schilling Donald L. and Belove E., "Electronics Circuits- Discrete and Integrated", 3rd Ed., McGraw-Hill, Reprint 2008.
2	Millman Jacob, Halkias Christos C. and Parikh C., "Integrated Electronics", 2nd Ed., McGraw-Hill, 2017.
3	Taub H. and Mothibi Suryaprakash, Millman J., "Pulse, Digital and Switching Waveforms", 2nd Ed., McGraw-Hill, 2007.
4	Mano Morris, “Digital Logic and Computer Design”, 5th Ed., Pearson Education, 2017.
5	Lee Samual, “Digital Circuits and Logic Design”, PHI, 2009.

ADDITIONAL REFERENCE BOOKS	
1	Malvin Albert & David J. Bates, "Electronic Principles", 7th edition, Tata McGraw Hill, 2017.
2	De Debashis, "Basic of Electronics", 1st Ed., Pearson Education, 2010.
3	Floyd and Jain, “Digital Fundamentals”, Pearson Education, 2017.

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Mathematics
Bachelor of Technology in Mathematics and Computing (MaC)

B.Tech. MnC - I, Semester – II Probability and Statistics MA136	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	explain the basic concepts of probability theory and measure of central tendency.
CO2	adapt the knowledge of various Probability models and its applications.
CO3	approximate any model into normal distribution using CLT.
CO4	explain the characteristics of sampling distribution and provide the point estimate and interval estimate for any model parameter.
CO5	able to understand the concept of prediction and fitting the real data to any model by using various test.

2	Syllabus	
	Review on Probability and Descriptive Measure	**(08 Hours)**
	Historical development, Measures of Central Tendency, Measures of Dispersion, Measures of relative standing, some principles of statistical model, Random variables, Classical Definition of Probability, Axiomatic Definition of probability, conditional probability and Bayes' theorem, Expected value, Moment generation function and variance of a random variable.	
	Probability Distributions	**(07 Hours)**
	Probability Distributions: Binomial, Geometric distribution, Hypergeometric distribution, Normal distribution, Gamma distribution, Exponential distribution, Negative Binomial distribution, Two-dimensional Random Variable, Joint, Conditional and Marginal distribution.	
	Central Limit Theorem	**(04 Hours)**
	Central limit theorem for Bernoulli trails, Normal approximation to binomial, Chebyshev, Inequality.	
	Sampling Methods	**(08 Hours)**
	Random Sampling and Methods of Sampling, Sampling Distribution and Standard Error, Sampling Distribution of the Sample Mean, Sampling Distribution of the Sample Proportion, Sampling Distribution of the difference between two sample means and Sampling Distribution of the difference between two sample proportions.	
	Estimation Methods	**(09 Hours)**
	Point Estimation, Maximum Likelihood Estimation, Method of Moment Estimators, Interval Estimation, Confidence Interval, Large Sample Confidence Interval for a Population Mean μ, Large Sample Confidence Interval for a Population variance, estimating the difference between two Population means.	
	Testing Of Hypothesis and REGRESSION	**(09 Hours)**
	Hypothesis, Null hypothesis, Alternate hypothesis, Type-I and Type-II Error, Level of significance, Critical region, Z-test, t-test, Chis-square test, F-test. Regression line x on y and y on x, Properties of the regression line, Real life example of regression.	

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Bachelor of Technology in Mathematics and Computing (MaC)

	Valuable Contribution of Indian Scientist/ Mathematician	
	C. R. Rao: Cramér: C. R. Rao inequality, Rao–Blackwell theorem and Rao score test. P. C. Mahalanobis: M-distance (D) and pioneering methodology for large-scale sample surveys. R. C. Bose: Methods in design of experiments. S. N. Roy: Roy's largest root test and fundamental methods in multivariate statistical analysis.	
	Tutorial will be based on the coverage of the above topics separately.	**(15 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours=60 Hours)	

3.	**Tutorial**
1.	Tutorial based on probability and descriptive measure-I
2.	Tutorial based on probability and descriptive measure-II
3.	Tutorial on probability distribution-I
4.	Tutorial on probability distribution-II
5.	Tutorial on Central limit theorem
6.	Tutorial on Regression
7.	Tutorial on Sampling Method-I
8.	Tutorial on Sampling Method-II
9.	Tutorial on Estimation Method-I
10.	Tutorial on Estimation Method-II
11	Tutorial on Testing of Hypothesis-I
12	Tutorial on Testing of Hypothesis-II

4.	**Books Recommended**
1	W. Mendenhall, R. J. Beaver and B. M. Beaver, Introduction to Probability & Statistics, 15th Edition, Cengage Learning, 2020.
2	C. M. Grinstead and J. L. Snell, Introduction to Probability, American Mathematical Society, 2nd Revised Edition, 2011
3	D. C. Montgomery, Applied Statistics and Probability for Engineers, 6th Edition, Wiley India Pvt Ltd., 2016
4	R. E Walpole, R. H. Myers, S. L. Myers and K. E. Ye, Probability & Statistics for Engineers & Scientists, 9th Edition, Pearson, 2010.
5	K. Black, Business Statistics: For Contemporary Decision Making, 9th Edition, Wi- ley, 2016.
6	S, C, Gupta and V. K. Kapoor: Fundamentals of Mathematical Statistics, twelve edition, Sultan Chand and Sons, 2020.

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Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Mathematics
Bachelor of Technology in Mathematics and Computing (MaC)

B.Tech. MnC - I, Semester – 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	

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	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	Kapoor, Kapil & Singh, Avadhesh Kumar (eds), "Indian Knowledge Systems", Vol. 1& II, DK Printworld, New Delhi, 2002.
5	Kohle, Pradeep, et al.(eds.) "Pride of India- A Glimpse of India's Scientific Heritage", Samskrit Bharati, 2006.
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.
9	Soni, Suresh. "India's Glorious Scientific Tradition" Ocean Books Pvt. Ltd. 2010.