No. Dean (Acad) / SEC-21/399 /2023-24 Date: 14-06-2024

Minutes of the Twenty First (21st) meeting of the Standing Executive Committee of Seante held on Wednesday, the June 12, 2024 at 4:30 PM in Institute Conference Room. The following members were present:

1	Prof. Anupam Shukla	Director	Chairman
2	Prof. H. K. Raval	In-charge Director	Invitee Member
3	Prof. C. D. Modhera	Dean (Faculty Welfare)	Member
4	Prof. Ravi Kant	Dean (Academic)	Member
5	Prof. S. R. Patel	Dean (Student Welfare)	Member
6	Prof. H. R. Jariwala	Asso. Dean (Academic)	Invitee Member
7	Dr. R.K. Jana	Asso. Dean (Academic)	Invitee Member
8	Dr. V.K. Patel	Asso. Dean (Academic)	Invitee Member
9	Dr. J.N. Sarvaiya	Head, DoEcE	Invitee Member
10	Dr. J.M. Dhodiya	Head, DoM	Invitee Member

Item: 21.1	To consider the recommendation of the 7th meeting of the DAAC of the Department of Mathematics, item no. 7.2, held on June 6, 2024, to approve the scheme of four years & first-year syllabus of the four-year B.Tech program in Mathematics & Computing (MaC).
Reso. 21.1	57th Meeting of the Senate held on March 10, 2023, approved the action plan to start a Dual degree program- Bachelor of Technology and Master of Technology in Mathematics & Computing (Mac) with the Academic Year 2024-25. Further, the 61st meeting of the Senate held on April 30, 2024, approved the scheme and syllabus with 30 intake. The matter was placed before the 50th Finance Committee and 73rd meeting of the Board of Governors held on May 22, 2024. It was resolved to offer the Four-year B.Tech in Mathematics & Computing (MaC) in place of Five Year dual degree program- Bachelor of Technology and Master of Technology in Mathematics & Computing (MaC). The Head of the Department presented the scheme of four years & syllabus of the first year of four four-year B.Tech in Mathematics & Computing (MaC) **(Annexure 1)**. Further, he informed the house that the department had conducted the curriculum revision workshop with the two external experts from the IITs. After deliberations, it was; **Resolved to approve the recommendations of the 7th meeting of the DAAC of the Department of Mathematics, held on June 06, 2024, regarding the scheme of the four-year & first-year syllabus of the four-year B.Tech program in Mathematics & Computing (MaC).**

Item: 21.2	To consider the recommendation of the 86th meeting of the DAAC of the Department of Electronics Engineering, item no. 86.1, held on June 3, 2024, to approve the scheme and syllabus of the first year of the four-year B.Tech program in Electronics and VLSI Engineering.
Reso. 21.2	57th Meeting of the Senate held on March 10, 2023, approved the action plan to start a Four-Year Bachelor of Technology in B.Tech.-I of Electronics and VLSI Engineering with the Academic Year 2024-25. The 50th Finance Committee and the 73rd meeting of the Board of Governors held on May 22, 2024, approved the program. The Head of the Department presented the scheme & syllabus of the first year of the four-year B.Tech in Electronics and VLSI Engineering **(Annexure 2)**. He informed the house that the scheme & syllabus of a first year B.Tech in Electronics and VLSI Engineering is similar to the current scheme & syllabus of a first year B.Tech in Electronics and Communication Engineering. House was of the opinion that the department shall prepare the scheme & syllabus of the 2nd, 3rd, and 4th year of the four-year B.Tech in Electronics and VLSI Engineering so that students who are selecting the course will have an idea of the entire scheme & syllabus before choosing the course. After deliberations, it was; **Resolved to approve the recommendations of the 86th meeting of the DAAC of Department of Electronics Engineering, held on June 03, 2024 regarding the scheme and syllabus of first year of four year B.Tech program in Electronics and VLSI Engineering.** **Further, resolved to upload the scheme of 2nd, 3rd and 4th year of four-year B.Tech in Electronics and VLSI Engineering at the earliest.**
Item: 21.3	To consider and approve the Seat Matrix and Eligibility for the Study in India Scheme for U.G., P.G., and Ph.D. programs for the academic year 2024-2025.
Reso. 21.3	Dean (Academic) informed the House regarding the study in India (SII) Program. He briefed about the meeting eligibility criteria across NITs for students admitted under the SII & ICCR scheme organized by the Ministry of Education, GoI, held on June 06, 2024. No uniform criteria exist for the students admitted to the NITs under SII and ICCR. There was an opinion that uniform rules should be developed across the NITs. Given this, the Information Brochure contains the eligibility, selection process, and number of seats for UG, PG, and Ph.D. **(Annexure 3)**. After deliberations, it was; **Resolved to approve the proposal of eligibility, selection process and number of seats for the U.G., P.G., and Ph.D. courses under the Study in India Scheme mentioned in the Information Brochure. The JEE Mains for U.G. and GATE for P.G. and Ph.D. is not a mandatory.** **Further, resolved to follow the JoSAA and CCMT eligibility criteria for U.G. and P.G. courses. The fee structure will be similar to those of DASA/ICCR students at U.G., P.G. and Ph.D. In case of NRI students, and the mandatory documents for eligibility other than 10+2 will be as per the criteria of DASA admission for U.G. and P.G.**

	Further, the fee structure for admission to the Ph.D. program will be similar to that of ICCR students of Ph.D. courses. The research scholars will be assigned the Full-Time International Research Scholar (FIS) category, a new addition to the category list. At every point, the upper limit for assigning Scholars under the FIS category is one for every supervisor. **Further, resolved admission will be on a self-sponsored basis, and the Institute will not provide scholarships to the students offered admission to the P.G. and Ph.D. courses.**
Item: 21.4	To sign the MoU for academic and research between IIT Madras and SVNIT Surat.
Reso. 21.4	The MoU committee of SVNIT discussed this issue in its 34th meeting held on April 3, 2024 and recommended the Dean (Academic) to thoroughly review the proposal of IIT Madras **(Annexure 4)**. The Dean's Academic Office reviewed the draft copy. It is finalized and put for the signature of the Honourable Chairman of the Senate and approval in this SEC meeting of the Senate. After deliberations, it was; **Resolved to approve and sign the MoU for academic and research between IIT Madras and SVNIT Surat.** **Further, resolved that in case any student is admitted for Direct PhD program at IIT Madras, one co-supervisor shall be from Sardar Vallabhbhai National Institute of Technology, Surat.**

Dean (Academic) 14.06.2024

Dean (Faculty Welfare) 14.06.2024

Dean (Student Welfare) 14.06.24

(Prof. J.N. Sarvaiya) 14/06/2024
Head, DoECE
Invitee Member

(Dr. J.M. Dhodiya) 14/06/24
Head, DoM
Invitee Member

Director 14/6/2024

Annexure-I

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)
	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	MA/CS/AI2XX	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	MA/CS/AI2AA	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)

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)

Annexure-I

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

	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	MA/CS/AI3XX	3-0-2	4	85
4	Elective-III**	MA3AA	3-1-0 3-0-2	4	70/85
5	Elective-IV (Specialization#1)	MA/CS/AI3BB	3-X-X	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	MA/CS/AI3XX	3-1-0	4	70
4	Elective-V**	MA/CS/AI3CC	3-1-0 3-2-0	4	70/85
5	Elective-VI (Specialization#2)	MA/CS/AIXDD	3-X-X	4	70/85
			Total	**20**	**380-410**
6	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**

**NPTEL, SWAYAM and other Massive Open Online Course (MOOC) approved by DAAC

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)

Annexure-I

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

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	MA/CS/AIXXX	3-0-2
6	Elementary Number theory	MA232	3-1-0
7	Design and Analysis of Algorithms	MA236	3-0-2
8	Machine Learning	MA/CS/AIXXX	3-0-2
9	Fundamentals of Artificial Intelligence	MA/CS300/AIXXX	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/CS/AI35X	3-1-0
14	Information Theory and Coding	MA367/CS/AI35X	3-1-0
15	Soft Computing	MA367/CS/AI35X	3-0-2
16	Operating Systems	MA368/CS/AI35X	3-0-2
17	Advanced Evolutionary Algorithms	MA360	3-0-2
18	Block Chain Technology	MA69/CS360/AI36X	3-1-0
19	High Performance Computing	MA70/CS/AI36X	3-1-0
20	Professional Ethics, Economics, and Business Management	MG210	3-1-0
	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

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

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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Annexure-I

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

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.	

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	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, 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.

Annexure-I

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

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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Annexure-I

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Mathematics
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)**

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)

	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.

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)

Annexure-I

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

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)

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

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.

Annexure-I

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

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.

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)

Annexure-I

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

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)**

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)

	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.

Annexure-I

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

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.	
	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)

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

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.

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)

Annexure-I

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

Department of Mathematics

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 and its applications, Introduction to popular Python libraries for machine learning (e.g., scikit-learn, TensorFlow).	

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)

Annexure-I

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

	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.
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.

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)

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.

Annexure-I

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

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

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)

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.

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)

Annexure-I

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.	

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)

Annexure-I

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

	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.	
	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.

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)

Annexure-I

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,	

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	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	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.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Electronics Engineering
B.Tech. Electronics and VLSI Engineering

Sr. No.	Subject	Code	Scheme L-T-P	Credits (Min.)	Notional hours of Learning (Approx.)
	First Semester (1st year of UG)				
1	Semiconductor Physics and Devices	EC101	3-1-0	4	70
2	Mathematics-I	MA117	3-1-0	4	70
3	Fundamentals of Computer and Programming	CS110	3-0-2	4	85
4	Fundamentals of Electrical Engineering	EE110	3-0-2	4	85
5	English and Professional Communication	HS110	3-1-0	4	70
			Total	**20**	**380**
6	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	ECV01 / ECP01	0-0-10	5	200 (20 x 10)
	Second Semester (1st year of UG)				
1	Mathematics-II	MA116	3-1-0	4	70
2	Electronic Circuits	EC102	3-0-2	4	85
3	Digital Logic Design	EC104	3-0-2	4	85
4	Network Analysis and Synthesis	EE104	3-1-0	4	70
5	Energy and Environmental Engineering	EG110	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)	ECV02 / ECP02	0-0-10	5	200 (20 x 10)

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Electronics Engineering
B.Tech. Electronics and VLSI Engineering

B.Tech. I (ECE) Semester – I SEMICONDUCTOR PHYSICS AND DEVICES EC101	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	understand the fundamental concepts and equations of semiconductor physics
CO2	apply the Basics of Semiconductor Physics
CO3	analyse Underline knowledge of semiconductor physics at device level
CO4	evaluate the carrier transport, V-I equations and various capacitances at device level
CO5	design of various industrial semiconductor devices

2.	Syllabus	
	FUNDAMENTALS OF SEMICONDUCTOR PHYSICS	**(12 Hours)**
	General material properties & crystal structures, elements of quantum mechanics, energy band/bond model, E-K diagrams and concept of effective mass, density of state,Classifications of semiconductors, Fermi-Dirac distribution function, equilibrium carrier concentration of holes/electrons in intrinsic/extrinsic semiconductors, drift, diffusion, excess carrier generation/recombination, carrier lifetime, continuity equation.	
	PN JUNCTION DIODE	**(10 Hours)**
	Junction Terminologies, Qualitative and Quantitative Analysis of Diode (Poisson Equation, space charge, built-in potential, depletion width), energy bands under different bias conditions, step vs linearly graded junctions, ideal diode volt-ampere equation, deviation from ideal characteristics, Avalanche and Zener breakdown, diode capacitances. reverse recovery transients.	
	BIPOLAR JUNCTION TRANSISTORS	**(06Hours)**
	Terminology, Simplified Structure, Electrostatics, General Operation Considerations, Performance Parameters, I-V characteristics of CE/CB/CC configuration, Ebers-Moll Model, base width modulation, Transistor as an Amplifier and Switch.	
	MOS FIELD EFFECT TRANSISTORS	**(11 Hours)**
	Classification, MOS Fundamentals, energy bands and charge under different bias conditions, flatband/accumulation/depletion/inversion condition in MOS junction, maximum depletion width, gate voltage relationships, C-V characteristics of MOS junction, threshold voltage of MOSFETs, qualitative and quantitative theory of MOSFETs, gradual channel approximation, channel length modulation, substrate bias effects, MOSFET Capacitances.	
	INDUSTRIAL SEMICONDUCTOR DEVICES	**(06 Hours)**
	Qualitative and Quantitative Theory of Schottky Diode, LED, Photo Diode, Solar Cell, UJT, JFETs.	
	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	Draw of E-K diagram under different material conditions
2	Density of states in semiconductor
3	Finding of Fermi position using Fermi-Dirac distribution function
4	Calculation of carrier concentration for intrinsic and extrinsic semiconductor under thermal equilibrium and Non- equilibrium
5	Mobility, conductivity evaluation and their temperature dependency
6	Evaluation of drift and diffusion carrier transport
7	V-I calculation of P-N Junction
8	Calculation of Built-in Potential, capacitance and break down voltages
9	V-I evaluation, and current gain relations in CE, CB and CC BJT
10	Evaluation of maximum depletion width and threshold voltage in MOS capacitor
11	Oxide capacitances and Fermi potential in MOS Junction
12	Drain current calculations and threshold voltage calculation of MOSFET
13	Substrate bias effects on threshold voltage and VI characteristics of MOSFET
14	Band gap calculation for LED and Solar cell
15	Barrier height calculation of Schottky Diode

4.	**Books Recommended**
1	R. F. Pierret, “Semiconductor Device Fundamentals”, 2nd Edition, Pearson, 2006.
2	Donald Neamen, “Semiconductor Physics & Devices”, 4th Edition, TMH, 2021.
3	B. G. Streetman and S. K. Banerjee, “Solid State Electronic Devices”, 7th Edition, Pearson, 2014.
4	S. M. Sze, “Physics of Semiconductor Devices”, 4th Edition, Wiley-Blackwell, 2021.
5	Y. Taur and H. Ning, “Fundamentals of Modern VLSI Devices”, 3rd Edition, Cambridge University Press, 2021.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Electronics Engineering
B.Tech. Electronics and VLSI Engineering

B.Tech. I (ECE) Semester – I MATHEMATICS-I MA117	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	learn various methods of solving ordinary differential equations of the first order and their importance in engineering problems
CO2	develop mathematical models through ordinary differential equations of the first order
CO3	describe the convergence and divergence of infinite series and analyse the Fourier integral and Fourier transform of a function
CO4	familiarise with special functions to evaluate some proper and improper integrals using beta and gamma functions
CO5	develop the basic concept of linear algebra for electronics engineering problems.

2.	Syllabus	
	ORDINARY DIFFERENTIAL EQUATION OF FIRST ORDER FIRST DEGREE AND FIRST ORDER HIGHER DEGREE	**(07 Hours)**
	Reorientation of differential equation first order first degree, Exact differential equation and Integrating factors, first order higher degree odes, solvable for p, y and x, Clairaut's equation.	
	APPLICATION OF DIFFERENTIAL EQUATION(MATHEMATICAL MODELLING)	**(07 Hours)**
	Modelling of Real-world problems, particularly Engineering Systems, Electrical network models (RL & RC circuit), the spread of epidemic (SI, SIS, SIR), Newton's Law of cooling, Single compartment modelling.	
	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.	
	FOURIER SERIES	**(07 Hours)**
	Definition, Fourier Series with Arbitrary Period, In Particular Periodic Function With Period 2π. Fourier Series of Even and Odd Functions, Half Rang Fourier Series.	
	FOURIER INTEGRAL AND TRANSFORM	**(07 Hours)**
	Fourier Integral Theorem, Fourier Sine and Cosine Integral Complex Form of Integral, Inversion Formula for Fourier Transforms, Fourier Transforms of the derivative of a Function.	
	BETA AND GAMMA FUNCTION	**(05 Hours)**
	Beta and Gamma function with their properties and duplications formula without proof.	
	SYSTEM OF LINEAR ALGEBRAIC EQUATION	**(05 Hours)**
	Linear systems, Elementary row and column transformation, Rank of matrix, consistency of the linear system of equations, Linear Independence and Dependence of vectors, Gauss Elimination method,	

	Gauss-Jordan Method, Gauss-Jacobi Iteration Method.	
	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	ORDINARY DIFFERENTIAL EQUATION OF FIRST ORDER -I
2	ORDINARY DIFFERENTIAL EQUATION OF FIRST ORDER-II
3	APPLICATION OF DIFFERENTIAL EQUATION
4	INFINITE SERIES-I
5	INFINITE SERIES-II
6	FOURIER SERIES-I
7	FOURIER SERIES-II
8	FOURIER INTEGRAL AND TRANSFORM-I
9	FOURIER INTEGRAL AND TRANSFORM-II
10	FOURIER INTEGRAL AND TRANSFORM-II
11	BETA AND GAMMA FUNCTION-I
12	BETA AND GAMMA FUNCTION-II
13	SYSTEM OF LINEAR ALGEBRAIC EQUATION-I
14	SYSTEM OF LINEAR ALGEBRAIC EQUATION-II
15	SYSTEM OF LINEAR ALGEBRAIC EQUATION-III

4.	**Books Recommended**
1	Kreyszig E., “Advanced Engineering Mathematics”, 10th Edition (Int. Student Ed.), John Wiley & Sons, Singapore, 2015.
2	James Steward De, “Calculus”, 9th Edition, Thomson Asia, Singapore, 2020.
3	O’Neel Peter, “Advanced Engg. Mathematics”, 7th Edition, Cengage, Singapore, 2012.
4	Tomas B. CO, “Methods of Applied Mathematics for Engineers and Scientists”, Cambridge University Press, 2013.
5	Prasad A. R., Erwin Kreyszig E., “Advanced Engineering Mathematics”, Wiley, 2014.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Electronics Engineering
B.Tech. Electronics and VLSI Engineering

B.Tech. I (ECE) Semester – I FUNDAMENTALS OF COMPUTER AND PROGRAMMING CS110	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 computer architecture, network and software development.
CO2	install an operating system and configure the network along with programming skills to solve the given problem.
CO3	debug network and operating system related issues and analyse the given problem.
CO4	evaluate programming solutions with different aspects.
CO5	design and develop solution for given problems.

2.	Syllabus	
	INTRODUCTION TO COMPUTER AND ITS ARCHITECTURE	**(02 Hours)**
	Introduction and Characteristics, Computer Architecture, Generations, Classifications, Applications, Central Processing Unit and Memory, Communication between various Units, Processor Speed, Multiprocessor System, Peripheral Buses, Motherboard Demonstration.	
	MEMORY AND VARIOUS INPUT AND OUTPUT DEVICES	**(02 Hours)**
	Introduction to Memory, Input and Output Devices, Memory Hierarchy, Primary Memory and its Types, Secondary Memory, Classification of Secondary Memory, Various Secondary Storage Devices and their Functioning.	
	NUMBER SYSTEMS	**(01 Hours)**
	Introduction and type of Number System, Conversion between Number System, Arithmetic Operations in different Number System, Signed and Unsigned Number System.	
	INTRODUCTION TO SYSTEM SOFTWARES AND PROGRAMMING LANGUAGES	**(04 Hours)**
	Classification of Computer Languages, Introduction of Operating System, Evolution, Type and Function of OS, Unix Commands, Evolution and Classification of programming Language, Feature and Selection of good Programming Language, Development of Program, Algorithm and Flowchart, Program Testing and Debugging, Program Documentation and Paradigms, Characteristics of good Program.	
	WINDOWS OPERATING SYSTEM AND ITS ENVIRONMENT	**(02 Hours)**
	Introduction to GUI based OS, Configuration, Setup, Services, Network Configuration.	
	LINUX OPERATING SYSTEM AND ITS ENVIRONMENT	**(02 Hours)**
	Introduction to Unix based OS, Configuration, Setup, Services, Scripting, Network Configuration.	

	DEBUGGING TOOLS AND COMPILER OPTION	**(04 Hours)**
	Different Debugging tools, Commands, Memory dump, Register and Variable Tracking, Instruction and Function level debugging, Compiler Options, Profile Generation.	
	DATA COMMUNICATION, COMPUTER NETWORK AND INTERNET BASICS	**(02 Hours)**
	Data Communication and Transmission media, Multiplexing and Switching, Computer Network and Network Topology, Communication Protocols and Network Devices, Evolution and Basic Internet Term, Getting Connected to Internet and Internet Application, Email and its working, Searching the Web, Languages of Internet, Internet and Viruses.	
	PROGRAMMING USING 'C' LANGUAGE – INTRODUCTION	**(06 Hours)**
	Characteristics of C Language, Identifiers and Keywords, Data Types Constants and Variables, Declarations and Statements, Representation of Expressions, Classification of Operators and Library Functions for Data Input and Output Statements, Formatted Input and Output Statements.	
	PROGRAMMING USING 'C' LANGUAGE – CONTROL STATEMENT, STRUCTURES, POINTERS	**(12 Hours)**
	Conditional Control Statements, Loop Control Statements, 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.	
	PROGRAMMING USING 'C' LANGUAGE – FUNCTIONS	**(06 Hours)**
	Functions, Passing the arguments, Return values from functions, Recursion, Header Files Design, File handling operations, Read and Write to Secondary Devices, Read and Write to Input and Output Ports.	
	PROGRAMMING USING 'C' LANGUAGE – GRAPHICS, DEBUGGING	**(02 Hours)**
	Include Graphics Library, Debugging, Linking, Compilation Option for Optimization, Make file.	
	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	Basic commands of Windows and Linux
2	Flow chart drawing and writing pseudo steps or algorithms steps
3	Programming for logic development using different control statements
4	Programming for familiarity with control statement, array, pointers
5	Programming using structures, pointers,programming using functions

4.	**Books Recommended**
1.	ITL Education Solutions Limited, "Introduction to Computer Science", Pearson Education, 2011.
2.	Gottfried B.S., "Programming with C-Schaum's outline Series", Outline Series, 4nd Edition, Tata McGraw-Hill, 2018.
3.	Brian W. Kernighan, Dennis M. Ritchie, "The C Programming language", 2nd Edition, Pearson Education India, 2015.
4.	E. Balagurusamy, "Programming in ANSI C", 8th Edition, Tata Mc-Graw Hill, 2019.
5.	Pradip Dey, "Programming in C", 2nd Edition, Oxford University Press, 2012.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Electronics Engineering
B.Tech. Electronics and VLSI Engineering

B.Tech. I (ECE) Semester – I FUNDAMENTALS OF ELECTRICAL ENGINEERING EE110	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	apply different methods to solve dc circuits
CO2	understand and solve coupled magnetic circuits
CO3	apply vector algebra for single-phase and three-phase AC circuits
CO4	understand the working principle of single-phase transformer and three-phase inductor motor
CO5	understand electrical wiring for domestic circuits

2.	Syllabus	
	ELECTRICALNETWORKANALYSIS	**(12 Hours)**
	Circuit Laws: KVL and KCL, Current division and voltage division rules, Independent and dependent sources, Mesh current analysis, Node voltage analysis, Thevenin's theorem, Norton's theorem, Source transformations, Superposition theorem, Maximum power transfer theorem, Reciprocity theorem, Star network to delta network transformation	
	MAGNETIC CIRCUITANDELECTROMAGNETICINDUCTION	**(08 Hours)**
	Ampere's circuital law, the analogy between electric & magnetic circuits, series-parallel magnetic circuits, Faraday's law, Lenz law, self-inductance, mutual inductance, coefficient of mutual inductance, coefficient of coupling, Equivalent inductance of series, parallel and series-parallel coupled coils, Analysis of coupled coils, dot rule, conductively coupled equivalent circuit.	
	SINGLE-PHASEAC CIRCUITS	**(08 Hours)**
	Complex algebra and its application to the analysis of AC circuits, R-L, R-C, R-L-C series and parallel circuits, series, and parallel resonance.	
	THREE-PHASE ACCIRCUITS	**(06 Hours)**
	Balanced three-phase systems, star and delta connections, the relation between line and phase variables in star and delta connections, three-phase phasor diagrams, and measurement of power in three-phase circuits.	
	SINGLEPHASETRANSFORMERS	**(05 Hours)**
	Construction and working principle of the transformer, transformer on no-load and with load, phasordiagram for transformer under no-load and loaded condition (with unity, lagging power factor load),equivalent circuit, open circuit, and short circuit tests, losses in the transformer, efficiency, and voltageregulation	
	THREE-PHASEINDUCTIONMOTOR	**(03 Hours)**

	Rotating magnetic field, construction and working principle, slip, equivalent circuit, different power stages, losses, and efficiency.	
	ELECTRICWIRING ANDILLUMINATION	**(03 Hours)**
	Circuits in domestic wiring, Types of lamps, fixtures & reflectors, illumination schemes for domestic, industrial & commercial premises, Lumen requirements for different categories, working principle of tube light (fluorescent tube), fan, and LED.	
	Practical 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	Studythedifferenttypesofwiringinelectrical circuits.
2	Tostudytheworkingprincipleoftubelightand fan.
3	Verifications of network theorems.
4	HysteresislooponCRO.
5	PowermeasurementinsinglephaseR-L/R-Cseriescircuits.
6	Verification of star-delta connections in a three-phasecircuit.
7	Three-phasepowermeasurementusingtwo wattmetermethod.
8	Determination of single-phase transformer equivalent circuit parameters using open-circuit and short-circuittests.
9	Loadteston a single-phasetransformer.

4.	**Books Recommended**
1	V.N. Mittle and Arvind Mittal, “Basic Electrical Engineering”, 2nd Edition, Tata Mcgraw-Hill Education Private Limited, 2015.
2	Robert Boylestad, “Introductory Circuit Analysis”, 13th Edition, Pearson Education India, 2015.
3	Charles K. Alexander and Matthew N.O. Sadiku, “Fundamentals of Electric Circuits”, 5th Edition, McGraw Hill Education 2013.
4	D.P Kothari and I.J. Nagrath, “Basic Electrical Engineering”, 4th Edition, Tata Mcgraw-Hill Education Private Limited, 2019.
5	C. L. Wadhwa, “Basic Electrical Engineering”, 5th Edition, New Age International Private Limited, 2023.

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B.Tech. I (ECE) 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, the 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 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	
	SPEAKINGSKILLS	**(10 Hours)**
	Effective Speaking, JAM, Presentation Skills- types, preparation and practice. Interviews- types, preparation and mock interview; Group Discussion- types, preparation and practice	
	WRITING SKILLS	**(10 Hours)**
	Prerequisites of effective writing, Memo-types, Letter Writing- types, Email etiquette and Netiquette, Résumé-types, Report Writing and its types, 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”, 10th Edition, Tata McGraw Hill publishing company limited. New Delhi, 2005.
4	Courtland L. Bovee, John V. Thill, and Mukesh Chaturvedi, “Business Communication Today”, 15th Edition, Pearson, 2021.
5	Mike Markel, “Practical Strategies for Technical Communication,” 4th Edition, Bedford/ St. Martin's, 2022.
6	Laura J. Gurak and John M. Lannon, “Strategies for Technical Communication in the Workplace,” 4th Edition, Pearson, 2019.

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B.Tech. I (ECE) Semester – II MATHEMATICS-II MA116	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	learn various methods of solving higher-order ordinary differentials and their importance to engineering problems
CO2	develop mathematical modelling through higher-order differential equations
CO3	analyse the importance of the Laplace transform, including its applications to differential equations
CO4	explain the fundamental concepts ofvector calculus and their role in modern mathematics and applied contexts.
CO5	find the eigenvalues and eigenvectors of the matrix and the importance of vector spaces and subspaces.

2.	Syllabus	
	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER	**(09 Hours)**
	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 Regular point, Singular point, series solution of ODE of 2nd order with variable coefficient with special emphasis to the differential equation of Legendre's and Bessel's for different cases of roots of indicial equations.	
	APPLICATION OF HIGHER ORDER ORDINARY DIFFERENTIAL EQUATION (MATHEMATICAL MODELLING)	**(04 Hours)**
	Electrical network models (LCR circuit), Bending of beam models.	
	LAPLACE TRANSFORM	**(06 Hours)**
	Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Inverse Laplace transform, Unit step functions, Dirac –delta functions, Laplace transform of periodic functions, Convolutions theorem, Application to solve simple linear and simultaneous differential equations.	
	VECTOR CALCULUS	**(07 Hours)**
	Partial differentiation, Euler's theorem for homogeneous function, Modified Euler's theorem Scalar and vector point function, differential operator, gradient, directional derivative, divergence, curl and Laplacian operator with their properties, Line integral, Surface Integral, Volume integral, Green's, Gauss and Stokes theorem (Only statement) & application.	
	MATRICES	**(06 Hours)**
	Properties of matrices, Non-singular Matrices, Reduced Row-Echelon form, Systems of linear equations, Solution of system of linear equations, LU Decomposition Method.	
	EIGENVALUES AND EIGENVECTORS	**(07 Hours)**
	Eigenvalues and eigenvectors, Characteristic polynomials, Minimal polynomials, Diagonalizability, Triangularization, Rational canonical form, Jordon canonical form, Positive Define Matrices, Singular Value Decomposition.	

	VECTOR SPACE AND SUBSPACES	**(06 Hours)**
	Fields, Vector spaces over a field, subspaces, Linear independence and dependence, coordinates, Bases and dimension, Gram-Schmidt orthonormalisation, Orthonormal basis, Orthogonal projection.	
	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	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER I
2	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER-II
3	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER-III
4	APPLICATION OF HIGHER-ORDER ORDINARY DIFFERENTIAL EQUATION
5	LAPLACE TRANSFORM-I
6	LAPLACE TRANSFORM-II
7	VECTOR CALCULUS-I
8	VECTOR CALCULUS-II
9	VECTOR CALCULUS-III
10	MATRICES-I
11	MATRICES-II
12	EIGENVALUES AND EIGENVECTORS-I
13	EIGENVALUES AND EIGENVECTORS-II
14	VECTOR SPACE AND SUBSPACES-I
15	VECTOR SPACE AND SUBSPACES-II

4.	**Books Recommended**
1	Malik S.C., and Arora S., “Mathematical Analysis”, 5th Edition, Wiley Eastern Ltd., New Age International Publishers, 2017.
2	Kreyszig E., “Advanced Engineering Mathematics”, 10th Edition, John Wiley, 2018.
3	Zill D. G, Wright W. S., “Advance Engineering Mathematics”, 5th Edition, Jones and Bartlett Publishers, Inc, 2012.
4	Gilbert Strang, “Introduction to Linear Algebra”, 5th Edition, Wellesley-Cambridge Press, 2016.
5	Kenneth Hoffman and Ray Kunze, “Linear Algebra”, 2nd Edition, PHI publication, 2009.

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B.Tech. I (ECE) Semester – II ELECTRONIC CIRCUITS EC102	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	design the diode based voltage limiter and regulator circuits
CO2	analyse the biasing techniques to stabilize the operating conditions of BJT/MOSFET based circuits
CO3	analyse different small signal amplifiers using BJT and MOSFETs
CO4	determine the low/mid frequency response of amplifier circuits
CO5	design the signal generators and evaluate the stability of analog circuits

2.	Syllabus	
	DIODE CIRCUIT	**(12 Hours)**
	Fundamentals of diode, Diode based circuits, clippers, clampers, voltage multipliers, peak detectors, half/full wave rectifiers, diode as gate, Zener diode voltage regulators, Varactor diode, Small Signal analysis of diode circuits.	
	BIASING OF TRANSISTORS	**(12 Hours)**
	Overview of BJT/MOSFETs, Load Line Analysis, DC Operating Points, Need of Biasing, current/voltage mode biasing, Fixed Bias Circuits, Self-Bias Circuits, Voltage Divider Bias Circuits, Stability Factor, Thermal Runaway, Thermal Stability, Transistor as a Diode.	
	LOW FREQUENCY SMALL SIGNAL AMPLIFIERS	**(11 Hours)**
	BJT as an amplifier, small signal models of BJT, CE/CC/CB amplifiers, emitter degeneration, multistage amplifiers, low frequency analysis of amplifiers, distortion in amplifiers, MOSFET as an amplifier, small signal models of MOSFET, CS/CD/CG amplifiers, source degeneration, multistage amplifiers with MOSFETs, analysis in the presence of external capacitors, swing limits, design examples.	
	OSCILLATORS	**(10 Hours)**
	Feedback concept, Stability Criterion, Sinusoidal Oscillators, Barkhausen Criterion, Analysis and design of RC Phase Shift (MOSFET/ BJT) Oscillator, Wien Bridge Oscillators. Resonant Circuit Oscillators, General form of Oscillator Circuit (Hartley and Colpitts), Crystal Oscillators, Multivibrators.	
	Practical 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	Diode Characteristic
2	Rectifiers and Filters
3	Zener as a voltage Regulator
4	BJT Characteristics
5	FET Characteristics
6	Common Emitter Amplifier
7	Common Source Amplifier
8	RC Phase Shift Oscillator
9	Wien Bridge Oscillator
10	Hartley/Colpitt Oscillator
11	Astable Multivibrator
12	MINI - PROJECT

4.	**Books Recommended**
1	R. L. Boylestad and L. Nashlesky, "Electronics Device & Circuits Theory", PHI, 11th Edition, 2015
2	J. Millman and C. Halkias, "Integrated Electronics", McGraw-Hill, 2nd Edition, 2017
3	D. A. Neamen, “Microelectronic :Circuits, Analysis & Design”, McGraw Hill, 4th Edition, 2021
4	J. Milman and A. Grabel, Microelectronics, McGraw Hill, 2nd Edition, 2017
5	A.S. Sedra and K.C. Smith, Microelectronic Circuits, Oxford Publishing House, 7th Edition, 2017
6	B. Razavi, “Fundamental of Microelectronics”, 3rd Edition, Wiley India, 2021

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B.Tech. I (ECE) Semester – I DIGITAL LOGIC DESIGN EC104	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	understand Boolean algebra, binary logic and logic circuits.
CO2	formulate combinational logic problems and solve using truth table and optimize using K-map and other equivalent technique.
CO3	design and analyse various sequential logic circuits
CO4	explain operation of synchronous sequential circuit, counters, registers and memory
CO5	describe digital hardware using RTL (Register Transfer Language) statements and derive logic circuit
CO6	realize circuits for ALU, Shifter and various Control unit architectures (Hardwired, Microprogram, PLA etc.)

2.	Syllabus	
	BOOLEAN ALGEBRA AND SIMPLIFICATION	**(08 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 CIRCUITS	**(08 Hours)**
	Binary Parallel Adder, BCD Adder, Encoder Priority Encoder, Decoder, Multiplexer and Demultiplexer Circuits, Implementation of Boolean Functions using Decoder and Multiplexer, Arithmetic and Logic Units, BCD-To-Segment Decoder, Common Anode and Common Cathode, Random Access Memory, Read Only Memory and Erasable Programmable ROMs, Programmable Logic Arrays(PLA) and Programmable Array Logic(PAL)	
	LATCHES AND FLIP-FLOPS	**(06Hours)**
	Cross-Coupled SR Flip-Flop Using NAND or NOR Gates, Clocked Flip-flops, D-Types and Toggle Flip-flops, Truth Tables and Excitation Tables for Flip-flop. Master Slave Configuration, Edge Triggered and Level Triggered Flip-flop, Flip-flop with Preset and Clear	
	SEQUENTIAL LOGIC CIRCUIT	**(08 Hours)**
	Introduction to State Machine, Mealy and Moore Model, State Machine Notation, State Diagram, State Table, Transition Table, Table Excitation, Table and Equation, Basic Concepts of Counters and Register, , Shift Left and Right Register, Registers with Parallel Load, Serial-in-Parallel-Out(SIPO) and Parallel-In-Serial-Out(PISO), Register Using Different Types of Flip-flop, Binary Counters, BCD Counters, Up Down Counter, Johnson Counter, Module-N Counter, Design of Counter using State Diagrams and Tables,	

	Sequence Generators	
	PROCESSOR LOGIC DESIGN	**(08 Hours)**
	Arithmetic, Logic and Shift Micro-Operation, Arithmetic Shifts, Design of Arithmetic Logic Unit (ALU), Control Unit Organization, Hard-Wired Control – One Flip Flop per State Method	
	INTRODUCTION TO VHDL	**(04 Hours)**
	Introduction, Data Type, Operators and Operands, Signal Assignment Statements (Concurrent, Conditional and Selected), Structural Modeling, Process Statement and Behavioral Modeling, HDL code for Registers, Flip-flop, Multiplexer, Adder/Subtracters and Tri-State Buffers	
	Tutorials will be based on the coverage of the above topics separately	**(14 Hours)**
	Practical will be based on the coverage of the above topics separately	**(28 Hours)**
	Total Contact Time: (42 Hours + 14 Hours + 28 Hours) = 84 Hours	

3.	**Practical**
(Following practicals are to be performed using discrete components)	
1	Introduction to variety of logic gates and digital ICs
2	Flip-flops using NAND/ NOR Gate.
3	Half-Adder/ Half-subtarctor Circuits using a serial Input.
4	Full-Adder/ Full-subtarctor Circuits using a serial Input.
5	Parity checker and parity generator circuit
6	4-Bit Gray To Binary/ Binary To Gray Code convertor using Select input.
(Following Practicals are to be performed on CPLD/FPGA kit using VHDL)	
7	(a) 1-Bit Full adder (b) 4-bit Ripple carry adder using structural modeling
8	4x1 MUX implementation using concurrent signal assignment statements
9	D and JK Flip flops with synchronous reset.
10	4-Bit Shift Left/Right Register.
11	4-bit Ripple counter with Asynchronous Reset.

4.	**Books Recommended**
1	Mano Morris, “Digital Logic and Computer Design”, Pearson Education, 1st Edition, 2016.
2	Anand Kumar, “Fundamentals of Digital Circuits”, 4th Edition, PHI, 2016.
3	Jain R. P. and Anand M. H. S., “Digital Electronics Practices using Integrated Circuits”, 1st Edition, TMH, 2004.
4	Ciletti D. M., Mano Morris, “Digital Design”, 6th Edition, Pearson Education, 2018.
5	Floyed Thomas L. and Jain R. P., “Digital Fundamentals”, 8th Edition, Pearson Education, 2006.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
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B.Tech. I (ECE) Semester – II NETWORK ANALYSIS AND SYNTHESIS EE104	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	develop a mathematical model (differential equations) of a given electric circuit andsolve it using the technique of domain transformation.
CO2	apply concept of graph theory for solution of ac and dc circuits.
CO3	analyze various parameters of a two-port network and interrelationship between them.
CO4	design filter circuits for given specifications.
CO5	synthesize electrical network for the given transfer function.

2.	Syllabus	
	GRAPH THEORY AND ITS APPLICATIONS	**(06 Hours)**
	Fundamental concepts, definitions of a graph and various related terms, cut sets and tie sets,matrices of oriented graphs, properties and interrelationships of incidence, tie set and cut setmatrices, complete circuit analysis using tie set and cut set techniques	
	LAPLACE TRANSFORMATION	**(06 Hours)**
	Laplace transform properties and theorems, Laplace transform of standard functions, Laplacetransforms for periodic functions, initial and final value theorems, Inverse Laplace transformusing partial fraction expansion, Waveform synthesis.	
	AC AND DC TRANSIENTS	**(06Hours)**
	Initial and final conditions of networks and their S-domain equivalent circuits , R-L, R-C andR-L-C DC transients, two mesh transients, R-L, R-C and R-L-C sinusoidal transient analysisusing Laplace transform methods, two mesh AC transients, complete response of RL, RCand RLC circuits to step, sinusoidal, exponential, ramp, impulse and the combinations ofthese excitations.	
	TWO PORT NETWORK ANALYSIS	**(07 Hours)**
	Two port network concepts, impedance, admittance, hybrid and transmission line parametersfor two-port networks and their interrelationship. Bridged T, Parallel T and Lattice network.	
	NETWORK FUNCTIONS	**(06 Hours)**
	Poles and zeros of a function, physical and analytical concepts, terminals and terminal pairs,driving point immittances, transfer functions, restrictions on locations of poles and zeros in S-plane. time domain behavior from pole-zero locations in the S plane, procedure for findingnetwork functions for general two-terminal pair network	
	TWO TERMINAL PAIR REACTIVE NETWORKS (FILTERS)	**(07 Hours)**
	Ladder network and its decomposition into tee, pie, and L sections, image impedance,image transfer function and applications to LC networks, attenuation and phase shift insymmetrical Tee and Pie	

	networks, constant K-filters, m-derived filters, problems ofterminations	
	NETWORK SYNTHESIS	**(07 Hours)**
	Two-terminal network synthesis. Properties of Hurwitz polynomial and Positive real function.Synthesis of LC, RC and RL Networks, Foster Forms and Cauer Forms.	
	Tutorials will be based on the coverage of the above topics separately	**(14 Hours)**
	(Total Contact Time: 45 Hours + 15Hours = 60 Hours)	

3.	**Tutorials**
1	Based on graph theory
2	Based on Laplace transformation and ac-dc transients
3	Based on Network functions and two-port networks
4	Based on reactive network filters
5	Based on network synthesis

4.	**Books Recommended**
1	Hayt W. H., Kemmerly J. E, Durbin S. M., "Engineering Circuit Analysis", 9th Edition, Tata McGraw Hill, 2020.
2	M.E. Van Valkenburg, "Network Analysis", 3rd Edition, Pearson Education, 2019.
3	Edminister Joseph A., "Electrical circuits", Schaum's outline series, 6th Edition, McGraw Hill, 2013.
4	Charles K. Alaxander, Matthew N.O. Sadiku, "Fundamentals of electric circuits", 6th Edition, Tata McGraw Hill, 2019.
5	Raymond A. Decarlo, Pen-Min Lin, "Linear Circuit Analysis", 2nd Edition, Oxford University Press, 2003.

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B.Tech. I (ECE) Semester – II ENERGY AND ENVIRONMENTAL ENGINEERING EG110	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	explain the components of ecosystems, various biogeochemical cycles and importance of different urban network services
CO2	differentiate between various types of environmental pollution along with their impacts and regulatory standards
CO3	examine various global environmental issues and their management
CO4	discuss the fundamental principles of energy, including classification, conservation and related policy frameworks and regulations**.**
CO5	get acquainted with the concept of energy systems and their components

2.	Syllabus	
	ENVIRONMENT AND ECOSYSTEMS	**(10 Hours)**
	Introduction: Concept of an ecosystem - structure and functions of ecosystem;Components ofecosystem - producers, consumers, decomposers; Food chains, food webs, ecological pyramids,energyflowin ecosystem;Bio-geochemicalcycles,hydrologic cycle Componentsofenvironmentandtheirrelationship,impactoftechnologyonenvironment,environmental degradation, environmental planning of urban network services such as watersupply,sewerage, solid waste management; closed loop cycle, concepts of sustainability	
	ENVIRONMENTAL POLLUTION	**(10 Hours)**
	Water, air, soil, noise, thermal and radioactive, marine pollution - sources, effects and engineeringcontrolstrategies; Centralized and decentralized treatment system, Drinkingwaterqualityandstandards,ambient airandnoisestandards	
	GLOBAL ENVIRONMENTAL ISSUES AND ITS MANAGEMENT	**(10 Hours)**
	Engineering aspects of climate change, concept of carbon credit, CO2 sequestration, concepts of environmental impact assessment and environmental audit, life cycle assessment	
	BASICS OF ENERGY AND ITS CONSERVATION	**(07 Hours)**
	Classification of energy sources, Global and national energy scenario, Fossil and alternate fuels and its characterization. General aspects of energy conservation and management; Energy conservation act, Energy policy of company; Need for energy standards and labelling; Energy building codes.	
	INTRODUCTION TO ENERGY CONSERVATION SYSTEMS	**(08 Hours)**
	Energy conversion systems: Working principle, Basic components, General functioning and normal rating specifications of various energy conversion systems like Power plant, Pump, Refrigerator, Air-conditioner, Internal combustion engine, Solar PV cell, Solar water heating system, Biogas plant. Wind turbine, Fuel cells.	

	Practical will be based on the coverage of the above topics separately	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	**Practical**
11	Determination of I-V Characteristics of solar PV Panel.
10	Study of electricity and or gas bill
11	Study of pollutants from diesel Engine
10	Study of pollutants from petrol Engine
11	Comparison of pollutants from SI and CI Engines.
11	Determination of I-V Characteristics of solar PV Panel.
10	Study of electricity and or gas bill
11	Study of pollutants from diesel Engine
10	Study of pollutants from petrol Engine

4.	**Books Recommended**
1	Daniel B Botkin & Edward A Keller, “Environmental Sciences”, John Wiley & Sons, 8th Edition, 2010.
2	R. Rajagopalan, “Environmental Studies”, Oxford University Press, 3rd Edition, 2015.
3	Benny Joseph, “Environmental Studies”, Mc Graw Hill publishers, 3rd Edition, 2017.
4	Suresh Dhameja, “Environmental Studies”, S K Kataria & Sons, 3rd Edition, 2009.
5	U. K. Khare, “Basics of Environmental Studies”, Tata McGraw Hill, 2011.
6	C. S. Rao, Environmental Pollution Control Engineering, New Age International Publishers, 3rd Edition, 2018.

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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", 3rd Edition, New Age Intl. Publishers, New Delhi, 2019.
4	Keay John, "Indi: A History", Harper Press, 2010.
5	Agrawal P. K., "Indian Culture art and Heritage", Prabhat Prakashan, 2020.
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", 26th Edition, Lexis Nexis, 2022.

Annexure 3

Study in India (SII) Academic Brochure

Programme: Bachelor of Technology (B.Tech.)

1 Eligibility

Those candidates who have passed Class 12 / equivalent (**Reference JoSAA**) examination in 2022, 2023 or 2024; or those who are appearing in Class 12 / equivalent examination in 2024, are eligible. Candidates who have passed Class 12/equivalent examination in 2021 or before as well as those who will appear in such examination in 2025 or later are not eligible. The candidate has secured minimum 75% of aggregate marks in the Class XII (or equivalent) examination of the respective stream and Board. Student must have opted following subjects during Class 12/equivalent.

(i) Physics
(ii) Mathematics
(iii) Any one of Chemistry, biology, biotechnology, technical vocation subject.
(iv) A language
(v) Any subject other than the above four

2 Selection

The merit list of all eligible students for B. Tech. will be prepared based on subjects mentioned in the eligibility clause.

3 No. of Seats

Sr. No.	Department	Number of seats
1.	Artificial Intelligence	6
2.	Chemical Engineering	6
3.	Civil Engineering	6
4.	Computer Science and Engineering	6
5.	Electrical Engineering	6
6.	Electronics and Communication Engg.	7
7.	Electronics and VLSI Engineering	3
8.	Engineering Physics	2
9.	Industrial Chemistry	2
10.	Mathematics and Computing	2
11.	Mechanical Engineering	10
12.	Artificial Intelligence (5 years Integrated B.Tech.+M.Tech.)	2
	Total	**58**

After admissions to the B Tech program of the SVNIT, Surat, the SVNIT academic regulation for the B Tech programme holds applicable.

Programme: Master of Technology (M. Tech.)

1	**Eligibility**
	B.E. / B.Tech. / B.Arch. or equivalent degree in respective discipline with minimum 60% marks (CGPA 6.5). The said percentage/CGPA, the above mentioned CGPA/Percentage should be awarded by a recognized University/Institute. Qualifying degree eligibility criterion (**as Per CCMT**)
2	**Selection**
	The selection criterion for the SII (Study in India) applicant for the M.Tech programme is based on the performance in the interview conducted by the concerned Department and CGPA/Percentage obtain in the qualifying degree. The merit list of all eligible students for M. Tech. will be prepared based on CGPA/Percentage and interview.
3	**No. of Seats**

Sr. No.	Department/Specialization	Number of seats
	Civil Engineering	
1	Environmental Engineering	1
2	Urban Planning	1
3	Water Resources Engineering	1
4	Transportation Engineering & Planning	1
5	Structural Engineering	1
6	Geotechnical Engineering	1
7	Construction Tech. & Mana.	1
	Electrical Engineering	
1	Power Electronics & Electrical Drives	1
2	Power Systems	1
3	Control and Automation	1
	Mechanical Engineering	
1	Mechanical Engineering	1
2	Turbo Machines	1
3	Thermal System Design	1
4	CAD/CAM	1
5	Manufacturing Engineering	1
	Computer Engineering	
1	Computer Engineering	1
2	Data Science	1
3	Information Security and Privacy	1
	Chemical Engineering	
1	Chemical Engineering	1
	Electronics Engineering	
1	Communication Systems	1
2	VLSI & Embedded Systems	1
	Total	**21**

All seats are allocated in each PG program under the sponsored category.

After admissions to the M Tech program of the SVNIT, Surat, the SVNIT academic regulation for the M Tech programme holds applicable.

Programme: Doctor of Philosophy (Ph.D.)

1 Eligibility

The Candidate shall possess Master Degree in relevant area of research with minimum 60% marks (CGPA 6.0) or equivalent in respective faculty. The said Percentage/CGPA with the above-mentioned CGPA/Percentage should be awarded by a recognized University/Institute. For greater details, **refer to subsection 4.5.2 of the Admission Section 4.5, page number 17 of Academic Regulation of SV NIT, July 2023 onwards**.

2 Selection

The selection criterion for the SII (Study in India) applicant for the PhD programme is the performance in the presentation/interview conducted by the concerned Department. The composition of interview panel is same as that of regular PhD admission interview at the Institute.

3 No. of Seats

Sr. No.	Department/Specialization	Number of seats
1	Chemical Engineering	3
2	Civil Engineering	3
3	Computer Science and Engineering	3
4	Electronics and Communication Engg.	3
5	Electrical Engineering	3
6	Mechanical Engineering	3
7	Artificial Intelligence	3
8	Chemistry	2
9	Mathematics	2
10	Physics	2
11	Management	1
12	English	1
	Total	**29**

<u>About the PhD Category and Supervision limit concerning the Study in India Scholar</u>

The Study in India (SII) Scholars admitted for the PhD programme of the Institute would be assigned the Full-Time International Research Scholar (FIS) category, a new addition in the category list. At every point of time, the upper limit for assigning Scholars under the FIS category is one for every supervisor.

After admissions to the PhD programme of the SV NIT, the SV NIT academic regulation for the PhD programme holds applicable.

Annexure 4

Memorandum of Understanding

Academic and Research Collaboration
between
Sardar Vallabhbhai National Institute of Technology, Surat, India
and
Indian Institute of Technology Madras, Chennai, India

Sardar Vallabhbhai National Institute of Technology Surat and Indian Institute of Technology Madras have agreed to the following protocols, governing their collaboration on academic and research related activities:

Scope

The scope of collaboration on academic and research activities in this Memorandum of Understanding includes the following categories:

- Academic and Research collaboration in the areas of mutual interest.
- Exchange of academic information, scholarly information, materials, and joint publications.
- Exchange of students and faculty.
- Sponsorship of cooperative seminars, workshops, and other academic meetings.

Student Exchange

Pursuant to the agreement for academic exchange, Sardar Vallabhbhai National Institute of Technology Surat and Indian Institute of Technology Madras will exchange students according to the terms laid out in Annexure 1. It is desired by both parties that there will be a significant flow of students in both directions.

Research Collaboration

Faculty from both institutions will collaborate in the supervision of exchange students and in joint research in disciplines of mutual interest. All such joint research activities will be governed by the terms laid out in Annexure 2.

Admission of the top 10% of the students of Sardar Vallabhbhai National Institute of Technology Surat to direct PhD at IIT Madras (subjected to availability at IITM)

Sardar Vallabhbhai National Institute of Technology Surat and IIT Madras agree to facilitate the top 10% of students **(subjected to availability at IITM)**, at the end of 6^{th} semester of Sardar Vallabhbhai National Institute of Technology Surat to seek admission to the direct PhD program of IIT Madras, and enable successful candidates to pursue the 7^{th} and 8^{th} semesters of their BTech program at IIT Madras, according to the terms laid out in Annexure

3. In case any student is admitted for Direct PhD program at IIT Madras, one co-supervisor will be from Sardar Vallabhbhai National Institute of Technology, Surat.

Commencement, renewal, termination, and amendment

This MOU will come into force upon affixing of the signatures of the representatives of the partner institutions and will remain in effect for five years. This MOU may be renewed upon its expiry, with the agreement of both partner institutions.

If either partner institution wishes to terminate the MOU at the end of the five years period, it must notify the other institution not less than six months prior to the expiry of the MOU.

This MOU or its renewal and the actions taken under it may be reviewed at any time. Modifications may be made by mutual agreement and any amendment or extension to the agreement may be formalized by the exchange of letters between the two parties.

Signed:	Signed:
SIGNATURE:	SIGNATURE:
Director, **Sardar Vallabhbhai National Institute of Technology, Surat,** **Surat-395007, Gujarat, India**	**Director,** **Indian Institute of Technology Madras** **Chennai, Tamil Nadu 600036, India**
DATE:	DATE:

Annexure 1

1. The institution where the student is admitted to earn a degree is the home institution and the institution to which the student is sent as an exchange student is the host institution.

2. Students under the student exchange program will be classified as special exchange students. Special exchange students will be permitted to take courses on credit/audit, as well as participate in research activities/project work.

3. In any case, the consent of the teacher/project supervisors/research supervisors at the host institution is required. Such consent will take into account among other things whether the student has successfully completed the pre-requisites for the course/project.

4. The Host Institution of students enrolled in this exchange program shall not levy tuition fees. Home Institution may continue to levy fees as applicable.

5. Course credits and grades earned will be determined by the home institution based on the grade report from the host institution.

6. The number of students and time duration will be worked out on a case-by-case basis.

7. Participants may not spend more than one year normally in the exchange program.

8. Participants, when they are in the host institution, will be subject to the rules and regulations of the host institution.

Selection and nomination
The selection and nomination of students is open throughout the academic year. The student nomination should be accompanied by:

- Curriculum vitae, with an official grade card/mark sheet.
- Statement of aptitude from a member of the student's school/faculty.
- A specific outline of the program of study at the host institution and a statement of objectives of the student.

When a nomination is forwarded by the home institution, it is presumed that the sending institution considers the student suitable for the proposed program and consents to send the student if selected by the host institution.

The host institution will evaluate the nomination and determine their suitability for selection under the Student Exchange Program.

Where the exchange student is pursuing a research or implementation project as part of the B.Tech, M.Tech, M.A., MBA, M.S., M.Sc., or PhD (or equivalent) degree program, the host institution will provide a suitable faculty member to jointly mentor (along with the supervisor in the home institution) the exchange student in formulating the research project or jointly supervising the exchange student in the event that a research project has already been identified.

The host institution will inform the home institution of any academic or other problems that may arise during the period of the student's residence in the host institution. The host institution will take appropriate action under its established policy and procedures, in consultation with the home institution to deal with such problems.

Annexure 2

1. Proposals for collaborative research work under this Memorandum will be submitted with the prior approval of the Head of each institution, or their nominee.

2. Each institution will nominate one of its members as its representative in charge of the cooperative program. Individual programs of work under this Memorandum will be jointly planned and conducted by the nominees of both parties.

3. Progress of work of any individual program will be reviewed and approved by designated authorities of both parties.

4. The final approval of any project will depend on the availability of guaranteed support funds.

5. Neither Sardar Vallabhbhai National Institute of Technology Surat nor Indian Institute of Technology Madras will be held responsible for any liability to the other party, and neither party shall be required to purchase any insurance against loss or damage to any property due to activities to which this agreement relates.

Every collaboration will have its own agreement/contract that addresses issues such as IPR, funding pattern, disclosure of information, etc.

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Annexure 3

Admission of the top 10% of BTech students of Sardar VallabhbhaiNational Institute of Technology Surat to Direct PhD program at Indian Institute of Technology Madras (subjected to availability at IITM)

Extract of Senate Norms for top 10% of BTech students of Sardar Vallabhbhai National Institute of Technology Surat seeking admission to PhD program at IITM.

a) Top 10% of the B. Tech students from other Institutions (which agree to participate in the program) who are in their 3rd year, with a minimum CGPA of 8.0 and without backlog/failures, will be eligible to apply for the Direct PhD(subject to availability at IITM).

b) Selected students will move to IIT Madras in their 4th year.

c) Credits earned during the 7^{th} and 8^{th} semesters at IIT Madras shall have equivalence to the credit needed for the 4th year of the B. Tech program. The credits will be transferred to the student's home institution for the award of the BTech degree.

d) After successfully completing the 7^{th} and 8^{th} semesters with CGPA > 8.0 at IIT Madras, and being selected for admission to the direct PhD program, these students are eligible for HTRA for five years from the date of joining the Direct PhD program. Students from CFTIs having a CGPA of 8 and above, will be eligible for the award of HTRA without the requirement of GATE. Students admitted from non-CFTIs are required to qualify in GATE for becoming eligible for the award of HTRA.

e) The direct PhD students must complete the comprehensive viva within 3 semesters after joining the direct PhD program of IIT Madras.

f) If a student earns a CGPA < 8.0 in the courses in the 7^{th} and 8^{th} semesters at IIT Madras, the student will be transferred back to the home institution along with credits earned.

g) If a student is not found fit to continue in the PhD program by their doctoral committee, they will be allowed to drop out any time after the 1st year of PhD, at which point the B. Tech credits will be transferred to the parent institute.

Specific Operational aspects agreed to by Sardar Vallabhbhai National Institute of Technology Surat and Indian Institute of Technology Madras

1. Sardar Vallabhbhai National Institute of Technology Surat will make an internal announcement to all the students who are in the top 10% of their class at the end of their 5th semester, with a minimum CGPA of 8.0 and without backlogs/failures, and encourage such students to apply for admission into a Direct PhD program at IIT Madras to those Department(s) in which they meet the eligibility norms for the regular PhD program**(will be subjected to availability at IITM)**,through the online portal between 1st March and 30th March every year.

2. Sardar Vallabhbhai National Institute of Technology Surat will encourage and recommend such students to opt for the summer fellowship of IITM at the end of their 6th semester.

3. Sardar Vallabhbai National Institute of Technology Surat will forward the list of students who are within the top 10% of their class, with a minimum CGPA of 8.0 and without backlogs/failures, along with their contact details,to the Dean (Academic Research), IIT Madras soon after the 6th-semester results are declared.

4. IIT Madras will forward the list of selected students for summer fellowship to Sardar Vallabhbhai National Institute of Technology Surat and also inform the respective students.

5. Selected students of Sardar Vallabhbhai National Institute of Technology Surat will move to IIT Madras at the end of 6th Semester and undergo paid summer fellowship at IIT Madras. On successful completion of the summer fellowship and on a favorable recommendation of the Hosting faculty and approved by the Head of Department, they may be permitted to pursue their 7th and 8th semesters at IIT Madras.

6. Sardar Vallabhbhai National Institute of Technology Surat will permit these students (selected for direct PhD programbased on availability at IITM) to pursue the final year of their B. Tech program (7th and 8th semester) at IIT Madras.

7. Sardar Vallabhbhai National Institute of Technology Surat will provide some flexibility in the curriculum for these students to facilitate them to complete the credits to be earned towards the award of the B Tech degree. Detailed planning of the courses to be taken at IIT Madras will be jointly decided by the faculty advisor of the student at Sardar Vallabhbhai National Institute of Technology Surat and the guide-designate at IIT Madras

8. These students should earn a minimum CGPA of 8.0 in 7th and 8thsemester at IIT Madras, to become eligible to join in the direct PhD program. Otherwise, the student will be transferred back to Sardar Vallabhbhai National Institute of

Technology Surat along with the credits earned.

9. These students are not eligible for campus placement through IIT Madras at the end of their first year, of study at IIT Madras, which will be the end of their 8th semester.

10. The student will pay the tuition fee to Sardar Vallabhbhai National Institute of Technology, Surat during their 7th and 8th semesters. After joining as a direct PhD student, the student will pay the tuition fee appropriate for PhD scholars as per regulations of IIT Madras, to IIT Madras.

11. With the concurrence of the guide-designate at IITM and the Doctoral Committee, faculty members from Sardar Vallabhbhai National Institute of Technology, Surat will serve as co-guides for these students.

12. These students shall come under the purview of the guidelines/regulations for the 7th and 8th semester BTech of Sardar Vallabhbhai National Institute of Technology, Surat in their 7th and 8th semesters, and under the PhD ordinances and Regulations of IIT Madras once they join the direct PhD.

13. For candidates who fail to complete the Comprehensive viva-voce exam, the option to convert to an MS program as per regulation R.21 in the PhD ordinances and regulations of IIT Madras, will be available.

14. If a student is not found fit to continue in the PhD program by their Doctoral Committee, they will be allowed to drop out any time after the 1st year of the direct PhD, at which point the 7th and 8th semester credits will be transferred to Sardar Vallabhbhai National Institute of Technology, Surat for the award of the B.Tech degree.