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

First Year of Five Years of Integrated M.Sc. (Physics)

Sr. No.	Subject	Code	Scheme L-T-P	Credits (Min.)	Notional hours of Learning (Approx.)
	First Semester (1st year of MSc)				
1	Waves and Mechanics	PH101	3-1-0	4	70
2	Basic Electronics	PH103	3-0-2	4	85
3	Thermodynamics and Statistical Physics	PH105	3-1-0	4	70
4	Numerical Methods and Computer Programming	PH107	3-0-2	4	85
5	Mathematics for Physical Sciences-I	MA123	3-1-0	4	70
6	Indian Value System and Social Consciousness	HS120	2-0-0	2	35
			Total	**22**	**415**
7	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	PHV01 / PHP01	0-0-10	5	200 (20 x 10)
	Second Semester (1st year of MSc)				
1	Electromagnetic Theory-I	PH102	3-1-0	4	70
2	Semiconductor physics	PH104	3-0-2	4	85
3	Mathematics for Physical Sciences-II	MA118	3-1-0	4	70
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)	PHV02 / PHP02	0-0-10	5	200 (20 x 10)

COURSE OFFERRED TO OTHER DEPARTMENTS

Sr. No.	Subject	Code	Scheme L-T-P	Credits (Min.)	Notional hours of Learning (Approx.)
	First Semester (1st year of B.Tech./ M.Sc.)				
1	Fundamentals of Physics (*for DoEE students*)	PH109	3-0-2	4	85
2	Physics of Materials and Nuclei (*for DoC students*)	PH111	3-0-0	3	55
3	Fundamentals of Physics (*for DoM students*)	PH113	3-0-2	4	85
	Second Semester (1st year of M.Sc.)				
1	Fundamentals of Physics-II (*for DoM students*)	PH106	3-0-2	4	85

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

First Year of Five Years of Integrated M.Sc. (Physics) M.Sc. - I, Semester - I WAVES AND MECHANICS PH101	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the semester students will be able to
CO1	Provide a basic understanding of vector algebra and coordinate systems.
CO2	Define the concepts of various laws of motion and moments of inertia.
CO3	Explain Euler's concepts related to rigid body motion.
CO4	Interpret the elastic properties of materials and rephrase the concept of hydrodynamics.
CO5	Develop an understanding of simple harmonic motions via various applications.
CO6	Classify waves and oscillations.

2.	Syllabus	
	FUNDAMENTALS OF VECTOR ALGEBRA AND DIFFERENT COORDINATE SYSTEMS	**(07 Hours)**
	Unit vectors, Vector operations, Scalar and vector triple products, Vector algebra in terms of the components, Differential calculus, Cartesian coordinate system, Cylindrical coordinate system, Spherical coordinate system.	
	NEWTON'S LAWS OF MOTION, CONSERVATION LAWS, AND MOMENTS OF INERTIA	**(08 Hours)**
	Mechanics of single and many particles, Equation of motion, Various conservation laws, Moments of inertia, Motion in the central force field	
	RIGID BODY MOTION	**(08 Hours)**
	Euler's theorem, Angular momentum and kinetic energy, Euler's equation of motion, Euler's angles.	
	ELASTICITY AND HYDRODYNAMICS	**(08 Hours)**
	Stress and strain, Young's modulus, Shear modulus and Bulk modulus, Buoyancy, Types of fluid flow, Bernoulli's equation, Viscosity, Terminal velocity.	
	WAVES	**(07 Hours)**
	Wave Motion, Interference and the principle of superposition, Reflection and transmission of waves, Standing waves, Vibration, Transverse and longitudinal waves; Propagation of sound wave, its properties, Beats, Diffraction, Doppler effect.	
	OSCILLATIONS	**(07Hours)**

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	Simple Harmonic Oscillations, Damped Oscillations, Coupled Oscillations, and Resonance.	
	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.	Proof of various relations formed using the different kind of vectors.
2.	Cover the various mechanical and electrical problems based on vector analysis.
3.	Though the numerical exercise one will learn the role of coordinate systems to solve the problems.
4.	Problems based on the motion of a single and many particles under the influence of different kind of forces.
5.	Projectile motion of particle, Motion of a charged particle in electromagnetic fields, Various problems related to moment of inertia.
6.	Numerical questions based on the aspects covered in the section of rigid body motion.
7.	Various types of questions for the calculation of stress, strain, young's modulus, shear modulus and bulk modulus;
8.	Numerical problems based on Bernoulli principles and terminal velocity.
9.	Basic numerical questions to understand the concept of waves on string and sound waves both and obtain various physical parameters used to quantify the waves.
10.	Problems based on simple harmonic motion, damped and coupled oscillations etc.

4.	**BOOKS RECOMMENDED**
1.	Mathur D. S., Mechanics, S. Chand & Company, 2000.
2.	Takwale R. G. & Puranik P. S., Introduction to Classical Mechanics, Tata McGraw-Hill Book Co., 1997.
3.	Feynman R. P., Lighton R. B. and Sands M., The Feynman Lectures in Physics Vol. 1, Narosa Publishers, 2008.
4.	Verma H. C., Concepts of Physics, Vol. 1 & 2, Bharati Bhavan, 2007.
5.	Landau L. D. & Lifshitz E M, Course on Theoretical Physics, Vol. 1: Mechanics, Addison- Wesley, 2002

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

First year of Five Years Integrated M.Sc. (Physics) M.Sc. – I, Semester – I BASIC ELECTRONICS PH103	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the semester students will be able to
CO1	Understand the basis concept of circuit analysis theorem
CO2	Demonstrate familiarity with basic electronic components and use them to design simple electronic circuits
CO3	Describe the application of transistors for Current and voltage amplification. Also, to describe the characteristics of different configurations of the transistor
CO4	Discuss the ideal of operational amplifier and their electrical parameters
CO5	Analyze and design the different types of Oscillators, and their applications

2.	Syllabus	
	BASIC CIRCUIT ANALYSIS	**(06 Hours)**
	Kirchhoff's current and voltage law, Network analysis, Superposition theorems.	
	SEMICONDUCTOR JUNCTION DIODES & APPLICATIONS	**(08 Hours)**
	The open circuit p-n junction, Energy bands in junction diode, I-V characteristics of p-n junction, diode as rectifier, Half-wave, full-wave, and bridge rectifier. Various applications of diode	
	SEMICONDUCTOR TRANSISTOR & APPLICATIONS	**(08 Hours)**
	Junction transistor, transistor construction, CB, CE and CC configurations, cut-off and saturation regions, transistor load-line, Quiescent point, Transistor as an amplifier, Current gain and voltage gain.	
	FREQUENCY RESPONSE OF AMPLIFIERS	**(07 Hours)**
	The gain-bandwidth product, frequency response of CB, CE and CC amplifier, Classification of amplifiers, Feed-back in amplifiers and its classification, Study of different properties with feed-back Amplifier applications.	
	OPERATIONAL AMPLIFIERS	**(08 Hours)**
	The differential amplifier, The basic operational amplifier, The emitter-coupled differential amplifier, Transfer characteristics of a differential amplifier, Offset error voltage and currents, Parameters, Frequency response.	
	OSCILLATORS	**(08 Hours)**
	Criteria for oscillation, tank circuit, L-C oscillator, Hertley Oscillator, Colpitt oscillator, The phase shift oscillator, the Wien bridge oscillator, Crystal oscillator.	

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	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.	Study and verification of Norton's Theorem.
2.	Study and verification of Thevenin's Theorem.
3.	Study and verification of Reciprocity Theorem.
4.	Study and verification of Superposition Theorem.
5.	Study and verification of Maximum Power Theorem.
6.	Study of Half Wave Rectifier.
7.	Study of Full Wave Rectifier.
8.	Study of Full Wave Bridge Rectifier.

4.	**Books Recommended**
1.	Ryder, J.D., Electronics fundamentals and applications: Integrated and Discrete Systems, Prentice – Hall of India,1999.
2.	Sze, S.M.,Physics of Semiconductor Devices, John Wiley & sons,1981.
3.	Floyd, T.L., Electronic Devices (5th ed). Pearson education Asia (2001).
4.	Malvino, A.P. Electronic Principles, Tata McGraw Hill,1999.
5.	Mottershed, A., Electronic Devices and circuits, Prentice Hall India,1989.

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

First year of Five Years Integrated M.Sc. (Physics) M.Sc. – I, Semester – I THERMODYNAMICS AND STATISTICAL PHYSICS PH105	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the semester students will be able to
CO1	Understand the fundamental concepts of thermodynamics laws and thermodynamic processes.
CO2	Acquire the knowledge of Maxwell's thermodynamics relations and thermodynamic potentials.
CO3	Learn the concepts of black body radiation from thermodynamics point of view.
CO4	Develop the fundamental concept of kinetic theory of gases.
CO5	Understand the properties of ideal gas and real Van der wall's gas state.
CO6	Learn various statistical distributions.

2.	Syllabus	
	FUNDAMENTALS OF THERMODYNAMICS	**(10 Hours)**
	Zeroth law of Thermodynamics, First and Seond laws of Thermodynamics, Work done in different Thermodynamic process, Heat capacity and Specific heat capacity, Internal energy and entropy, Heat engine, Carnot Cycle and Theorem, Calculations of change of internal energy and entropy in various thermodynamic processes.	
	THERMODYNAMICS POTENTIALS &MAXWELLS RELATIONS	**(08 Hours)**
	Internal Energy, Gibbs and Helmholtz energy, Gibbs paradox and its resolution, Enthalpy, Maxwell's thermodynamic relations, Application of Maxwell's thermodynamic relations.	
	THERMODYNAMICS OF BLACK BODY	**(06 Hours)**
	Black body and characteristics, Radiation principles like Rayleigh Jeans, Weins and Planck's law of black body radiation.	
	KINETIC THEORY OF GASES	**(07 Hours)**
	Maxwell Boltzmann equation, Postulates of kinetic theory of gases, velocity of gas molecules, Molecular energy, Kinetic-molecular model of an ideal-gas, kinetic interpretation of temperature, Degree of freedom of gas molecules, Maxwell's law of equipartition of energy.	
	TRANSPORT PROPERTIES	**(07Hours)**
	Viscosity of a gas, Thermal conductivity of gases, Van der wall's equation of state, Brownian motion.	

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	BASIS OF STATISTICAL PHYSICS	**(07 Hours)**
	Concept of microstate and macro state, Phase space, Principle of equal a priori probabilities Thermodynamic probability, Fermi Dirac, Maxwell Boltzmann and Bose Einstein distributions.	
	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.	Cover a variety of numerical problems to understand the concepts of thermodynamics.
2.	Problems based on refrigerator, heat engine and Carnot engine to understand its working principle through.
3.	Calculation of various equilibrium quantitates such as heat capacity, internal energy, pressure, volume, temperature etc. using the thermodynamics potential and Maxwell's relations.
4.	Numerical exercise on Maxwell Boltzmann equation and distribution function to understand its concepts used in Kinetic Theory of gases.
5.	Problems to obtain the various equilibrium quantities derived in the section of kinetic theory of gases.
6.	Problems based on transport properties of gases mainly focused on the calculation of viscosity and thermal conductivity.
7.	Problems based on radiation principles, Wein's and Planck's law related to the thermodynamics of black body radiation.
8.	Basic problems to get the idea about the various terminology used in statistical physics for example, microstate, macro state, configuration space, phase space, probabilities;
9.	problems based on Fermi Dirac, Maxwell Boltzmann and Bose Einstein distributions.

4.	**Books Recommended**
1.	Sears F. W. & Salingar, Thermodynamics, Kinetic theory and Statical Thermodynamics, 3rdEdition. Addison-Wesley/Pearson,1975.
2.	Young & Freedman, Sears and Zemansky's University Physics, Pearson Education, Singapore,2004.
3.	Feymann R. P., Leighton R. B. and Sands M., The Feymann Lectures in Physics, Vol.1 Narosa Publishers,2008.
4.	Zemanasky M. W., Heat and Thermodynamics, (McGraw Hill),1957

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First year of Five Years Integrated M.Sc. (Physics) M.Sc. – I, Semester – I NUMERICAL METHODS AND COMPUTER PROGRAMMING PH107	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the semester students will be able to
CO 1	students will be able to understand basics about error and numerical solution method for solving Algebraic and Transcendental Equations
CO 2	Analyze about interpolation and curve fitting method for solve real world problems
CO 3	Understand about method for Numerical integration and Ordinary Differential Equations
CO 4	Understand of basics of computers and programming language
CO 5	students will be able to simulate that physical science problems by knowing some compiler languages

2.	Syllabus	
	BASICS OF COMPUTER PROGRAMMING	**(10 Hours)**
	Operating systems, higher level compiler languages, algorithm; flow charting, C Language: Introduction to C language, identifiers and keywords, data types, constants and variables, arithmetic expressions; input and output statements, conditional statements: while-loop, for-loop, do while–loop; arrays; logical operators and expressions, structures: switch, break and continue statements	
	C PROGRAMMING	**(06 Hours)**
	C Language: functions; structures; pointer data type; random and sequential files, file handling in C	
	NUMERICAL METHOD FOR FINDING ROOTS OF EQUATION	**(06 Hours)**
	Error in Numerical Calculation, Errors and their computations, Absolute, relative and percentage errors, general error formula Solutions of Algebraic and Transcendental Equations, Bi-Section Method, Graphical Method, Regular False, Newton Raphson Method	
	NUMERICAL INTERPOLATION AND POLYNOMIAL CURVE FITTING	**(07 Hours)**
	Interpolation, Finite Difference, Forward difference, backward difference, Central Difference, Newton interpolation formula, Lagrange interpolation formula, Least Square Fitting Method & Curve Fitting by polynomials	
	NUMERICAL METHOD FOR INTEGRATION AND ORDINARY DIFFERENTIAL EQUATIONS	**(08 Hours)**
	Numerical Integration, Newton-Cote's formula, Trapezoidal, Simpson 1/3rd and 3/8th rule and Weddle rules.	

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	Numerical Solutions of Ordinary Differential Equations: Euler, Picard and Taylor series methods, Runge–Kutta 2nd order and 4th order method,	
	C PROGRAMMING PRACTICE	**(08 Hours)**
	C Programs: Program writing in C for interpolation, integration, roots of equations, matrix diagonalization, solution of differential equations. Good programming practices.	
	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	Error in numerical computation, error in construction of a model, approximations, Truncation error and their estimation
2	Solutions of Algebraic and Transcendental Equations using Newton Raphson method
3	Interpolation using Lagrange's formula
4	Linear square fitting and Curve fitting by polynomials method
5	Numerical Integration using Simpson 1/3rd method
6	Numerical Solutions of Ordinary Differential Equations using Runge–Kutta Method
7	Writing and testing C program for Error calculation
8	Writing and testing C program for Newton Raphson method
9	Writing and testing C program for Lagrange's formula
10	Writing and testing C program for Curve fitting
11	Writing and testing C program for Simpson 1/3rd method
12	Writing and testing C program for Runge–Kutta Method

4.	**Books Recommended**
1	Steven C. Chapra and Raymond P. Canale, Numerical Methods for Engineers. 7th Edition, Tata McGraw Hill,2021
2	S. S. Sastry, Introductory Methods of Numerical Analysis , 2nd Edition, PHI, 2012
3	J. D. Hoffman, Numerical Methods for Engineers and Scientist, 2nd Edition, CRC Press, 2018
4	C. Xavier, C Language and Numerical Methods, 2nd Edition, New Age publishers, 2007
5	Herbert Scheldt, C: The Complete Reference, 4th Edition, McGraw Hill Education, 2018

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Five Years Integrated M.Sc. Physics

First year of Five Years Integrated M.Sc. (Physics) M.Sc. – I, Semester – I MATHEMATICS FOR PHYSICAL SCIENCES-I MA123	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the semester students will be able to
CO1	Explain the basic concept of ordinary differential equation with its different forms and methods
CO2	Discuss the related Applications in Mathematical Modelling and with knowledge of Ordinary differential equations, can resolved here.
CO3	Narrate about the series solution and Frobenius series solution with different point
CO4	Illustrate the PDE with linear and Non-linear equations and its solution
CO5	Discuss the Vector calculus and System of Linear Algebraic equations

2.	Syllabus	
	ORDINARY DIFFERENTIAL EQUATION	**(10Hours)**
	Reorientation of differential equation first order first degree, exact differential equation and Integrating factors, first order higher degree odes, solvable for p, y and x, Solution of homogenous equations higher order, complementary functions, Particular Integrals, Linear differential equation with variable coefficient, Cauchy's Euler and Legendre's equation with variable coefficient, Method of variation of parameters.	
	APPLICATION OF DIFFERENTIAL EQUATION (MATHEMATICAL MODELLING)	**(07 Hours)**
	Modeling of Real world problems particularly Engineering System, Electrical network models (LCR), spread of epidemic (SI, SIS, SIR), Newton's Law of cooling. Single compartment modelling, Bending of beam models.	
	SERIES SOLUTION AND SPECIAL FUNCTIONS	**(07 Hours)**
	Regular point, Singular point, series solution of ODE of 2nd order with variable coefficient with special emphasis to differential equation of Legendre's and Bessel's for different cases of roots of indicial equations.	
	INRODUCTION TO PARTIAL DIFFERENTIAL EQUATION	**(08 Hours)**
	Introduction to Partial differential equation, Formation of partial differential Equation, Partial differential Equation of first order, Linear partial differential equation of first order (Pp+Qq-R) and method of obtaining its general solution, Non-linear partial differential equation of first order f(p, q)=0, f(z.,p.,q)=0, f(x, p)=g(y,q), z=px + qy +f(p,q).	
	VECTOR CALCULUS	**(07 Hours)**
	Scalar and vector point function, differential operator, gradient, directional derivative, divergence, curl and Laplacian operator with their properties, Line integral, Surface Integral, Volume integral, Green's, Gauss and Stokes theorem (Only statement) & application.	

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	SYSTEM OF LINEAR ALGEBRIC EQUATION	**(06 Hours)**
	Linear systems, Elementary row and column transformation, rank of matrix, consistency of linear system of equations, Linear Independence and Dependence of vectors, Gauss Elimination method, Gauss-Jorden Method, Gauss-Jacobi Iteration Method	
	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 one will be related to Ordinary differential equations.
2	Tutorial two, also will be on ordinary differential equations with variable co-efficient.
3	Tutorial three will be on different examples of ordinary differential equations.
4	Tutorial four will be on Mathematical modelling.
5	Tutorial five will be on Series solution and other special cases of it.
6	Tutorial six will cover partial differential equations.
7	Tutorial seven will be on examples of partial differential equations.
8	Tutorial eight will be on Vector Calculus.
9	Tutorial nine will be on applications of Area, Volume.
10	Tutorial ten will be on system of linear algebraic equations

4.	**Books Recommended**
1	Kreyszing E., Advanced Engineering Mathematics, John Wiley & Sons, Singapore, Int Student Ed. 2015.
2	James Steward De, Calculus, Thomson Asia, Singapore, 2003.
3	O'Neel Peter., Advanced Engg. Mathematics, Thompson, Singapore, Ind. Ed. 2002.
4	Hilderband, F. B., Methods of Applied mathematics, PHI, New Delhi, 1968
5	Wiley C. R., Advanced Engineering Mathematics, McGraw Hill Inc., New York Ed. 1993,
	Reference Books
1	Ramana D. V., Higher Engg. Mathematics, The MaGraw-Hill Inc., New Delhi, 2007.
2	Hay George E., Vector and Tensor Analysis. Dover Publications, 2012.
3	Srimanta Pal, Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, New Delhi, 2015.
4	Boas.Mary L., Mathematical Methods in the Physical Sciences, John Wiley & Sons,Ed.2005.
5	Kapur. J. N., Mathematical Models in Biology and Medicine. East west Press, New Delhi 1985.

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

B.Tech.1 /M.Sc. 1 Semester I/ II 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	
	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	
	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)**

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)

	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)

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

4.	**Books Recommended**
1	Kumar, Sanjay and Pushp, Lata. *Communication Skills*, 2nd Edition, OUP, New Delhi, 2015.
2	Raman, Meenakshi & Sharma Sangeeta. *Technical Communication Principles and Practice*, 3rd Edition, OUP, New Delhi, 2015.
3	Raymond V. Lesikar and Marie E Flatley. *Basic Business Communication skills for Empowering the Internet generation.* Tata McGraw Hill publishing company limited. New Delhi 2005.
4	Courtland L. Bovee, John V. Thill, and Mukesh Chaturvedi. "Business Communication Today." Ninth Edition. Pearson, 2009.
5	Mike Markel. "Practical Strategies for Technical Communication," Bedford/ St. Martin's Second Edition, 2016
6	Laura J. Gurak and John M. Lannon. "Strategies for Technical Communication in the Workplace," Pearson, 2013.

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

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

First year of Five Years Integrated M.Sc. (Physics) M.Sc. – I, Semester – II ELECTROMAGNETICS – I PH102	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the semester students will be able to
CO1	Understand the basics of vector algebra, coordinate transformations and differential operators
CO2	Interpret the Coulomb's and Gauss's law and their application in electrostatics
CO3	Classify the electric fields in conductors and dielectrics and extend it to understand the polarization effects and apply to boundary value problems
CO4	Interpret the Lorentz force, Biot-Savert's and Ampere's law and their applications in magneto statics
CO5	Interpret the Legendre polynomials and Bessel functions and relate their applications
CO6	Understand the magnetization in materials and explain the magnetic fields in matter

2.	Syllabus	
	VECTOR CALCULUS	**(07 Hours)**
	Vector Algebra, Coordinate Systems and Transformations, Differential Length, Differential Area and Differential Volume; Line, Surface and Volume Integrals, Gradient, Divergence, Curl and Laplacian (Cartesian & Polar Coordinates)	
	ELECTROSTATICS	**(07 Hours)**
	Coulomb's Law, Intensity of Electric field, Gauss's Law and its Application, Divergence and curl of Electric Field, Electric Potential, Work and Energy in Electrostatics.	
	ELECTRIC FIELDS IN MATTER	**(07 Hours)**
	Conductors, Dielectrics, Polarization, The Field of Polarized Object, The Electric Displacement, Boundary Conditions, Conduction and Convection Currents, Ohms Law	
	BOUNDARY VALUE PROBLEMS	**(08 Hours)**
	Laplace equation in one-, two- and three-dimensions, 1st and 2nd uniqueness theorem, Classic image problem, Induced surface charge, Force and energy, Other image problems, Separation of variables, Multipole expansion.	
	MAGNETOSTATICS	**(08 Hours)**
	The Lorentz Force Law, Biot-Savert's law, The Divergence and Curl of Magnetic Field, Magnetic vector potential, Magnetic flux density, Ampere Circuital Law and its Application.	
	MAGNETIC FIELDS IN MATTER	**(08 Hours)**
	Magnetization in Materials, The field of a Magnetized Object, The auxiliary field H, Linear and non-linear media, Magnetic Boundary Conditions	

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)

	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.	Problems based on Vector calculus.
2.	Solving problems using concept of Surface and Volume Integrals, Gradient, Divergence
3.	Calculation of electric field applying Gauss's law.
4.	Problems based on the electric field in matter.
5.	Solving problems using concept of bound charges.
6.	Solving boundary value problems.
7.	Solving image problems
8.	Problem solving using Separation of variables method and Multipole expansion.
9.	Various types of problems for Calculation of magnetic field.

4.	**Books Recommended**
1.	Griffiths D. J., Introduction to Electrodynamics, 3rd Ed. Prentice – Hall of India Private Limited 1999.
2.	Edminister J. A., Schaum's Outline series, Theory and Problems of Electromagnetics, McGraw Hill,1993.
3.	Sadiku M.N.O., Elements of Electromagnetics, 3rd Ed., Oxford University Press, 2003.
4.	Stewart J. V., Intermediate Electromagnetic Theory, Allied Publishers (with World Scientific), 2005.
5.	Jackson J. D., Classical Electrodynamics, Wiley Eastern,2012

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

First year of Five Years Integrated M.Sc. (Physics) M.Sc. – I, Semester – II SEMICONDUCTOR PHYSICS PH104	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the semester students will be able to
CO1	Understand the working of various FET devices and their applications
CO2	Understand the principle of operation of DIAC and TRIAC devices
CO3	Identify the principle of operation and structure of SCR devices
CO4	Interpret the concept of heterojunction devices and their applications
CO5	Classify the characteristics of various photonic devices
CO6	Examine the properties and applications of microwave devices

2.	Syllabus	
	INTRODUCTION	**(06 Hours)**
	Semiconductor Fundamentals, intrinsic & extrinsic semiconductors, free carrier and carrier concentration and Fermi-level. Scattering and Drift, Mobility, Hall Effect, excess carriers, Metal Semiconductor Contacts (Schottky and Ohmic), Schottky barriers; Schottky barrier height, C-V characteristics, current flow across Schottky barrier: thermionic emission	
	VARIOUS FET DEVICES: INTRODUCTION, CHARACTERISTICS AND APPLICATION	**(09 Hours)**
	Types of FET, JFET, MODFET, SIT, MOSFET, Structure and principle of operation of MOSFET,MOSFET as an amplifier, MOSFET analysis, Threshold voltage. Power MOSFET, HEMT, Compare JFET and BJT-List the merits of JFET over BJT, Principle of operation of CMOSFET.	
	DIAC, TRIAC: INTRODUCTION, CHARACTERISTICS AND APPLICATION	**(06 Hours)**
	Structure of DIAC, DIAC Principle of operation, Structure, and principle of operation of TRIAC, Applications of TRIAC.	
	PNPN: INTRODUCTION, CHARACTERISTICS AND APPLICATION	**(06 Hours)**
	The silicon-controlled rectifier, Device structure, Principle of operation, Equivalent circuit, Applications.	
	INTRODUCTION TO THE HETERO JUNCTIONS AND APPLICATIONS	**(06 Hours)**
	Concept of Heterojunction, Multilayer Heterojunction, Energy band diagram for Heterojunction, Confinement of charge carrier, Application of Heterojunction.	
	PHOTONIC DEVICES: INTRODUCTION, CHARACTERISTICS AND APPLICATION	**(06 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)

	Light Emitting Diode (LED), Characteristics of LED, Materials and wavelength of light, Laser diode, Structure, Characteristics of laser diode, Photodiode and solar cell, Display devices, Operation of LCDs, LED, HDTV, Plasma displays	
	MICROWAVE DEVICES: INTRODUCTION, CHARACTERISTICS AND APPLICATION	**(06 Hours)**
	MESFET, HEMT	
	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.	Study of the characteristics of Unijunction Transistor (UJT) and to calculate interbase resistance and intrinsic standoff ratio.
2.	To study the VI characteristic of TRIAC with positive and negative biasing and plot the curve between V & I.
3.	To study the phenomenon of holding current and latching current in TRIAC.
4.	To study the RC Phase shift oscillator using BJT.
5.	To study the VI characteristic of DIAC with positive biasing and plot the curve between V & I.
6.	Study and plot V-I characteristic of SCR.
7.	To study the phenomenon of holding current and latching current in SCR.
8.	To study the triggering of SCR using OP-AMP 741 and to study the application of SCR in alarm circuit.

4.	**Books Recommended**
1.	Schilling D.L. and Belove, C., Electronic Circuits : Discrete and Integrated, McGraw Hill, 1989.
2.	Streetman, B. & Banerjee S. Solid State Electronic Devices, Prentice Hall,2005.
3.	Boylestad R.L. and Nahselsky, L. Electronic Devices and Circuit Theory, Prentice Hall,2005.
4.	Liao S.Y., Microwave Devices and Circuits, Prentice Hall ,1996.

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

First year of Five Years Integrated M.Sc. (Physics) M.Sc. – I, Semester – II MATHEMATICS FOR PHYSICAL SCIENCES -II MA118	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the semester students will be able to
CO1	Explain about infinite series
CO2	Discuss the Fourier series and periodic functions and with different period
CO3	Narrate the Fourier transform and theorems
CO4	Explain Complex Variables
CO5	Illustrate basic of statistics and sampling theory and estimation

2.	Syllabus	
	INFINITE SERIES	**(05 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,	
	FOURIER SERIES	**(07 Hours)**
	Definition, Fourier series with arbitrary period, in particular periodic function with period 2π. Fourier series of even and odd function, Half range Fourier series	
	FOURIER TRANSFORM AND FOURIER TRANSFORM OF AN INTEGRAL	**(07 Hours)**
	Fourier transform and its operational properties, Fourier Integral theorem, Fourier Cosine and solution, transform of derivatives, Inversion formula for Fourier transforms.	
	COMPLEX VARIABLES	**(06 Hours)**
	Basic mathematical concept, Analytic function, Cauchy – Riemann equations, Harmonic functions, its applications, Linear transformation of complex domain, bilinear transformations, conformal mapping and its application, complex integration over closed contour.	
	BASIC OF STATISTICS AND PROBABILITY DISTRIBUTION	**(06Hours)**
	Reorientation of random experiments, events, probability and its distributions of Binomial &Poisson‟s, their properties and Normal distribution, jointly distributed random variables, expected values, function of random variable moments, moment generating functions.	
	SAMPLING THEORY AND ESTIMATION	**(07 Hours)**
	Some basics of sampling, statistical inference, Random Samples, Sampling distribution, Sample mean, variance and other statistics, point estimate and interval estimate confidence of interval, maximum likehood estimate.	
	TESTING OF HYPOTHESIS	**(07 Hours)**

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	Sampling and Test of significance, Statistical hypothesis and significance, Type I and Type II errors, Test of significance. Level of Significance, single tail and two tail tests hypothesis Chi-square (2χ)test, student‟s t Test of significance of the mean of a random sample,t-test for difference of means of two small samples, Snedecor‟s variance ratio test or F-test and tis 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 one will be related to infinite series.
2.	Tutorial two will be on different test of infinite series for its convergence.
3.	Tutorial three, will be on Fourier series.
4.	Tutorial four will be on Fourier transform.
5.	Tutorial five will cover examples of Fourier integral theorem.
6.	Tutorial six will be on Complex variables.
7.	Tutorial seven will cover basic of statistics.
8.	Tutorial eight will be based on Probability Distribution.
9.	Tutorial nine will be based on Sampling theory.
10.	Tutorial ten will be on Estimation: different test and its applications.

4.	**Books Recommended**
1.	Kreyszing E., Advanced Engineering Mathematics, John Wiley & Sons, Singapore, Int. Student Ed. 1995.
2.	Wiley C. R., Advanced Engineering Mathematics, McGraw Hill Inc., New York Ed. 1993
3.	O‟Neil Peter., Advanced Engg. Mathematics, Thompson, Singapore, Ind. Ed. 2002.
4.	Greenbar Michael D., Advanced Engg. Mathematics, Pearson, Singapore, Ind. Ed. 2007.
5.	Ramana D. V., Higher Engg. Mathematics, The MaGraw-Hill Inc., New Delhi, 2007.

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

First year of Five Years Integrated M.Sc. (Physics) M.Sc. – I, Semester – II FUNDAMENTALS OF ELECTRICAL ENGINEERING EE110	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the semester 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-PHASE AC 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 AC CIRCUITS	**(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, phasor diagram 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 voltage regulation	
	THREE-PHASEINDUCTIONMOTOR	**(03 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)

	Rotating magnetic field, construction and working principle, slip, equivalent circuit, different power stages, losses, and efficiency.	
	ELECTRIC WIRING AND ILLUMINATION	**(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 tubelight (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	Study the different types of wiring in electrical circuits.
2	To study the working principle of tube light and fan.
3	Verifications of network theorems.
4	Hysteresis loop on CRO.
5	Power measurement in single phase R-L/R-C series circuits.
6	Verification of star-delta connections in a three-phase circuit.
7	Three-phase power measurement using two wattmeter method.
8	Determination of single-phase transformer equivalent circuit parameters using open-circuit and short-circuit tests.
9	Load test on a single-phase transformer.

4.	**Books Recommended**
1	Mittle. V.N. and Mittal. Arvind, Basic Electrical Engineering, 2nd Edition, Tata-Mcgraw-Hill Education (India) Private Limited,2006
2	Boylestad. Robert, Introductory Circuit Analysis, 12th Edition, Pearson Education India, 2013
3	Alexander. Charles K. and Sadiku. Matthew N.O., Fundamentals of Electric Circuits, 5th Edition, McGraw-Hill Education (India) Private Limited., 2013
4	Kothari. D.P. , and NagrathI.J., Basic Electrical Engineering, 3rd Edition, Tata Mcgraw-Hill Education (India) Private Limited, 2010
5	Wadhwa. C. L., Basic Electrical Engineering, 2nd Edition 2011, New Age International Private Limited, 20111

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

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

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

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

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

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