Shivaji University, Kolhapur.

Revised Syllabus For

B. Sc. – M. Sc. Integrated, Part – I (SEM-I and II)
(Nanoscience and Technology)

to be implemented from the academic year 2015-16

(June 2015) onwards.

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Semester-I
Course Structure

Course N0.	Title	Credits		Examination/Evaluation of marks				
		L	P	T		P		Total
				Int.	Final	Int.	Final	
SNST-101T	Mechanics, Properties of Matter and Optics	3	-	20	80	-	-	100
SNST-102T	Fundamentals of Chemical Sciences –I	3	-	20	80	-	-	100
SNST-103T	Fundamentals of Life Science	3	-	20	80	-	-	100
SNST-104T	Mathematical Science	3	-	20	80	-	-	100
SNST-105T	Electronic Devices and Circuits	3	-	20	80	-	-	100
SNST-106T	Basic Concepts in Communication (Non Credit course)	-	-	-	-	-	-	-
SNST-111P	Laboratory Course I	-	2	-	-	-	50	50
SNST-112P	Laboratory Course II	-	2	-	-	-	50	50
SNST-113P	Laboratory Course III	-	2	-	-	-	50	50
SNST-114P	Laboratory Course IV	-	2	-	-	-	50	50

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Semester-II
Course Structure

Course N0.	Title	Credits		Examination/Evaluation of marks				
		L	P	T		P		Total
				Int.	Final	Int.	Final	
SNST-201T	Optics, Thermodynamics, Electricity and Magnetism	3	-	20	80	-	-	100
SNST-202T	Fundamentals of Chemical Sciences -II	3	-	20	80	-	-	100
SNST-203T	Chemical basis of life, Biomolecules, Metabolism.	3	-	20	80	-	-	100
SNST-204T	Computational Method I	3	-	20	80	-	-	100
SNST-205T	Digital Electronics	3	-	20	80	-	-	100
SNST-206T	Communication in Practice (Non Credit course)	-	-	-	-	-	-	-
SNST-211P	Laboratory Course I	-	2	-	-	-	50	50
SNST-212P	Laboratory Course II	-	2	-	-	-	50	50
SNST-213P	Laboratory Course III	-	2	-	-	-	50	50
SNST-214P	Laboratory Course IV	-	2	-	-	-	50	50

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-101T

Total Marks: 100
(80+20)

B. Sc. – I, Semester-I

Title of the Paper: Mechanics, Properties of Matter and Optics

Topic No.	Credits: 3	Lectures 45
1	**Unit- I (Mechanics-I)** **1) Elementary Dynamics of Rigid Bodies :** Analogy of rotational motion with translational motion, Moment of inertia of a spherical shell, solid cylinder (only about axis of symmetry), formulae for Moment of Inertia of different geometrical objects. **2) Oscillatory and Wave Motion**: Damped oscillations, case i) Over damped ii) Critically damped and iii) Damped, forced oscillations, amplitude resonance and Q factor (statement only). Theory of simple pendulum, Kater's pendulum, conical pendulum, Bifilar pendulum**.**	12
2	**Unit- II (Mechanics-II)** 1) Wave motion, Differential equation of progressive wave, Group velocity and phase velocity 2) Gravitation: Newton's inverse square law of gravitation, Concept of Gravitational field intensity and potential due to solid sphere. 3) Fluid Dynamics: General concepts of fluid flow, Streamline and turbulent flow, the equation of continuity, Bernoulli's Theorem, its application - venturimeter.	11
3	**Unit- III (Properties of matter)** **1) Elasticity:** Review of elasticity and modulus of elasticity, Bending of beam, Bending moment, Cantilever (Qualitative treatment only) **2) Surface Tension :** Surface tension, Angle of contact and wettability, Relation between surface tension, excess of pressure and radius of curvature, Experimental determination of surface tension Capillary rise method and Jaeger's method, Factors affecting surface tension, Applications of surface tension. **3) Viscosity:** Viscous fluids, Flow of liquid through capillary tube, Poiseuille's equation, Experimental determination of coefficient of viscosity of liquid by Poiseuille's method, effect of temperature and pressure on viscosity of liquid. **4) Thermal Properties:** Modes of heat transfer, specific heat, Debye Theory	12
4	**Unit- IV (Optics)** **1) Geometrical optics:** Aberration: Chromatic aberration, achromatic combination of two thin lenses separated by finite distance, Spherical aberration, methods to minimize it. **2) Optical instruments**: Entrance and exit pupils, Common types of eyepieces, Huygen's eyepiece and Ramsden's eyepiece. **3) Fiber Optics:** Introduction, Some historical remarks, Total Internal Reflection, The optical fiber, Attenuation in optical fiber.	10

Main references:

1. Elements of Properties of Matter – D.S. Mathur, Shamlal Charitable trust New Delhi.
2. Optics –B.K.Mathur
3. Optics –Ajoy Ghatak

Add on References (Useful throughout the integrated course)

1. Berkeley Physics Course Vol.I -Vol.V
2. The M.I.T. introductory Physics Series
3. Lectures in Physics Vol. I, II and III – Feynman, Leighton, Sands
4. University Physics 9th edition – Young and Freedman.
5. Fundamentals of Physics Vol. I and Vol. II – David Halliday and Robert Resnik
6. Mathematical Methods for Physicists - Arfken
7. Mathematical Methods in Physical Sciences,- Mary . L. Bose
8. Mathematical Physics – Ghatak, Goyal and Chua
1. 9 Foundations of Electromagnetic Theory – Ritz and Milford

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-111P

Total Marks: 50

B. Sc. – I, Semester-I

Title of the paper: Laboratory-course I (PS)

Sr. No.	**(Credit 2)**
1	Moment of inertia of a disc using auxiliary annular ring.
2	Bifilar Pendulum – Determination of M.I. of a rod.
3	Kater's Pendulum.
4	Poission ratio for rubber using rubber tube.
5	Y -by uniform bending.
6	Surface Tension of Liquid by Jaeger's method.
7	Viscosity of a liquid by Poiseuille's method.
8	Frequency of a.c. mains by sonometer.
9	Calibration of Spectrometer – unknown wavelength measurement.
10	Liquid Lens

Reference Books for Laboratory Course

1. College Practical Physics – Khanna and Gulati (S. Chand and Co. Ltd, Delhi).
2. Practical Physics – Gupta and Kumar (Pragati Prakation Meerat)
3. Advanced Level Practical Physics– J.M. Nelcon, J.M. Ogloom (EIBS).
4. Advanced Practical Physics–Worsnop and Flint.
5. A Text Book of Practical Physics-Shrinivasan and Balasubramanyam.
6. A Text Book of Practical Physics – Indu Prakashan and Ramkrishna.

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-102T

Total Marks: 100
(80+20)

B. Sc. – I, Semester-I

Title of the Paper: Fundamentals of Chemical Sciences -I

Topic No.	Credits: 3	Lectures 45
1	**Unit- I** Revision of first law of thermodynamics, terminology and formulation. Statement of Zeroth law, Second law of thermodynamics, carnot cycle, mechanical efficiency, Irreversible and reversible processes of system and their entropy changes Entropy changes, isobaric, isothermal, isochoric for ideal gas, Entropy changes in chemical reactions. Kinetic theory of gaseous assumptions, Maxwell distribution of molecular velocity, Ideal and non- ideal gases, deviation of gases from ideal behavior, compressibility factor (Z), van der Waal's equation of state and its application to explain deviation of gases, Critical Phenomena : PV-isotherms of real gases (Andrew's isotherms), Continuity of state, relationship between critical constants and Van der Waal's constants, the law of corresponding states and reduced equation of state. (numerical problems).	12
2	**Unit- II** Chemistry of bonds: Ionic bond formation, energetics. Born- Haber cycle, Fajan's rule, radius ratio, radius ratio effect and calculation of r+/r- for octahedral geometry. Covalent bonds: Lewis theory-Octet rule, exception to octet rule, Valence bond theory (VBT), Concept of hybridization – Definition, different types of hybridization, Geometry of molecules, Valence Shell Electron Pair Repulsion (VSEPR) Theory, Molecular Orbital Theory (MOT), Hitler – London Theory, Pauling – Slater Theory. L. C. A. O. Method, bonding , Anti-bonding and non-bonding molecular orbitals, s-s, s-px, px-px and py-py or pz-pz overlaps, energy level Sequence for Molecular Orbital when n=1 and n=2 12. Bond order and its significance, Molecular Orbital diagrams for a)Homonuclear diatomic molecules- N_2^+ , N_2, N_2^- , O_2^+ , O_2, O_2^-), Hetero nuclear diatomic molecules- CO, NO. Hydrogen bonding: Types of hydrogen, bonding, effect of hydrogen boding on physical properties of substances like. a) Physical State b) MP & BP c) Solubility d) Viscosity Coordinate and metallic bonds, examples.	12

3	**Unit- III** Properties of organic compounds, Sources of organic compounds, applications of organic compounds revisiting IUPAC nomenclature of organic compounds. Covalent bond, Hybridization in organic molecules (sp3 , sp2 , sp), bond length, bond angles, bond energies, localized & delocalized chemical bond, van der Waal's interactions, Inter & Intra molecular forces & their effects on physical properties. Structural effects like inductive, Resonance, Hyper conjugation, steric effect, Hydrogen bounding. Concept of isomerism, type, (Structural chain, position, functional group), Representation of organic, Molecules – zig- zag structures, projection formulae – (Saw horse (Andiron), Newman, Fisher & Dotted – wedge), Conformational isomerism in alkanes, free rotation about carbon- carbon single bond, conformation of ethane, propane n, butane , relative stability of different conformations, Optical isomers – Isomer number & tetrahedral carbon atom chirality, optical isomerism with one asymmetric carbon atom, Polarimeter, Specific rotation, Enantiomerism R & S Nomenclature. Geometrical isomerism – Definition, conditions for geometrical isomerism, cis-trans & E-Z nomenclature, physical & chemical properties of geometrical isomerism.	14
4	**Unit- IV** Acids and Bases: Arrhenius concept, Bronsted-Lowry concept, Lewis concept, Lux-Flood concept. Atomic structure: Historical Development, Daltons atomic theory and limitations, discovery and properties of electron. e/m ratio of electron by Thomson's method Charge on electron by Millikens oil drop method, discovery of proton and properties, 'Thomson's Atomic model and its drawbacks. Rutherford's alpha particles scattering experiments, Rutherford's atomic model and its drawbacks. Prouty's hypothesis, Moseley experiment and its importance, discovery of proton and properties, atomic spectra. Ritz – combination principle	07

Reference Books:

1) University General Chemistry. By C.N. R. Rao. Mc Millan Publication.

2) Principles of Physical Chemistry. By Maron and Pruton 4th Ed. Oxford and IBH publication.

3) Physical Chemistry. By G.M. Barrow.

4) Principles of Physical Chemistry Puri, Sharma and Pathania, Vishal Publishing House, 44th Edition

5) Advanced Physical Chemistry Gurdeep Raj GOEL Publishing House, 36th Edition

6) Principles of Structure and reactivity by J.E. Huheey

7) Principles of inorganic chemistry by Puri, Sharma and Kalia

8) Concise Inorganic Chemistry by J. D. Lee

9) Advanced Inorganic Chemistry by Satya Prakash Tuli, Basu & Madan 6th edn

10) Organic Chemistry by Clayden, Oxford uni.press.

11) Organic Chemistry by Morrison & Boyd, 6th Edition.

12) A guide book to Mechanism in Organic Chemistry by Peter Sykes, 6th Edition.

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-112P

Total Marks: 50

B. Sc. – I, Semester-I

Title of the paper: Laboratory-course II (CS)

Sr. No.	**(Credit 2)**
1	Use of analytical or chainometric or. Digital balance with 1mg sensitivity is allowed.
2	Determination of viscosity of given liquids A and B. (Density data of liquids, viscosity of water to be given) [Any two liquids from: [Acetone, CCl4, Chloroform, Ethyl alcohol. Benzyl alcohol, Ethylene glycol and n-propyl alcohol].
3	Determination of equivalent weight of Mg by Eudiometer.
4	Study of specific reaction rate of hydrolysis of methyl acetate in presence of HCl.
5	Estimation of aniline.
6	Identification of at least three organic compounds with reactions including one from acids, one from phenols, one from bases and one/two from neutrals from the list of compounds given below : Acids : Oxalic acid, Benzoic acid and Cinnamic acid. Phenols : β-Naphthol, Resorcinol. Bases : Aniline, p-Toluidine. Neutrals : Acetone, Ethyl acetate, Glucose, Chloroform, Chlorobenzene, m-Dinitrobenzene, Thiourea. Note : A systematic study of an organic compound involves the following operations which should be taught in details with reactions the detection of elements and functional group. Preliminary tests and Physical examination. • Physical constant. • Detection of Elements. • Detection of Functional group. • A Search into the literature. • Special Test. • Summary. • Result.
7	Determination of amount of acetic acid in commercial vinegar using NaOH.
8	Water analysis: To determine alkalinity of water

	sample by using phenolphthalein and methyl orange indicator. Standard HCl solution to be supplied.
10	Volumetric Analysis : To prepare standard solution of Potassium dichromate and determine strength of Ferrous Ammonium Sulphate solution in terms of normality and Kg/dm3. (Use internal indicator)

Reference Books for Laboratory Course

1. Practical book of Physical Chemistry: Nadkarni, Kothari & Lawande.
2. Experimental Physical Chemistry: A. Findlay.
3. Systematic Experimental Physical Chemistry: S. W. Rajbhoj, Chondhekar. (Anjali Publ.)
4. Experiments in Physical Chemistry: R. C. Das and B. Behra. (Tata Mc Graw Hill)
5. Advanced Practical Physical Chemistry: J. B. Yadav (Goel Publishing House.)
6. Practical Physical Chemistry: B. D. Khosala. (R. Chand & Sons)
7. Experiments in Chemistry: D. V. Jagirdar.
8. A Text Book of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis: A.I. Vogel (Third Ed.) (ELBS)
9. Vogel's Text Book of Quantitative Chemical Analysis. (Longmann) ELBS Edition.
10. Vogel's Text Book of Qualitative Chemical Analysis. (Longmann) ELBS Edition.
11. Hand book of Organic Qualitative Analysis : Clarke.
12. Comprehensive Practical Organic Chemistry – Qualitative Analysis by V. K. Ahluwalia, Sunita Dhingra. University Press. Distributor – Orient Longman Ltd.
13. Vogel's Text Book of Inorganic Quantitative Chemical Analysis (Longman) ELBS Edition.
14. Vogel's Text Book of Inorganic Qualitative Chemical Analysis (Longman) ELBS Edition.
15. Basic Concepts in Analytical Chemistry (Wiley Eastern Ltd.) : S. M. Khopkar.

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-103T

Total Marks: 100
(80+20)

B. Sc. – I, Semester-I

Title of the Paper: Fundamentals of Life Science

No	Topic	Lectures (45)
1	**UNIT I** **Life:** Concept and characteristics of life, theory of origin of life, cell theory, understanding the diversity of life, three domains system, six kingdom system, major groups of living organisms, classification of organisms based on cellular structure, introduction to detailed structure of Prokaryotic cells. (4L) **History and scope of microbiology:** Discovery of microorganisms, the conflict over spontaneous generation, relationship between microorganisms and disease. (2L) **Water, pH, buffers:** Properties of Water, Structure and Interactions, Water as a Solvent, Proton Mobility, Acids, Bases, and Buffers, Acid–Base Reactions, Buffers Polyprotic Acids. (4L).	**10**
2	**UNIT II** **World of microbes**: specimen preparation for study of microbial structure. **Microscopes:** Resolving power, angular and numerical apperature, oil immersion, types of microscope, the light microscopes, bright field microscope, dark field microscope, Phase-contrast microscope, differential interference contrast microscope, fluorescence microscope. Introduction to electron microscopy, SEM, TEM. fixation of specimen, Stains and dyes, differential staining, Grams staining. (6L)	**6**
3	**UNIT III** **Prokaryotic cell structure and function:** Size, shape, and arrangement, prokaryotic cell wall, peptidoglycan structure, cell membranes, Gram positive and Gram negative cell walls, internal membrane systems. The Cytoplasmic matrix, inclusion bodies, ribosome, nucleoide. Components external to the Cell wall, capsules, slime layers, and S-Layers, pili and fimbriae, ultra structure of flagella and motility, bacterial endospores. Introduction to prokaryotic life forms: Archeae, Bacteria, Eubacteria.. (12L)	**12**
4	**UNIT IV** **Eukaryotic cell structure and function:** cell wall, membrane, mitochondria, chloroplast, endoplasmic reticulum, Golgi apparatus, lysosome, peroxisomes, ribosomes, proteosomes, cytoskeleton. Ultrastructure of nucleus, chromosome, chromatid, nucleosome. Plant cell and animal cell structure. **Introduction to Eukaryotic life forms**: Protist and protozoas. (12L). General classification of plant kingdom: Algae, Fungi, Lichen, Bryophytes, Pteridophytes, Gymnosperm, Angiosperm. (5L)	**17**

Reference Books:

1. Devlin R.M. Fundamentals of plant physiology (MacMillan)
2. Malik C.P. Plant physiology, Kalyani publisher
3. Dube H.C. Text of fungi, bacteria and viruses.
4. Bold H.C. The Plant kingdom, Prentice - Hall India
5. Chopra G.L. i. Class book of algae, ii. Class book of fungi
6. Dutta A.C. A Class book of botany, Oxford University Press
7. Kumar H.D. Biodiversity and sustainable development (Oxford & IBH)
8. Mukherji H. Plant groups (New central book depot)
9. Kotpal – Invertebrates
10. Kotpal – Chordates
11. Shukla and U. Pandey- Applied Zoology.
12. Biochemistry – Stryer
13. Enzymes - Trevor Palmer
14. Biochemistry - J. L. Jain
15. Basic Biophysics- M. Daniel
16. Biochemistry - Powar and Chatwal

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-113P

Total Marks: 50

B. Sc. – I, Semester-I

Title of the paper: Laboratory-course III (LS)

No	Credit 2
1	Introduction to biological laboratory, instruments, their operation and safety measure to be taken.
2	Introduction to light microscope, its part and function.
3	Microscopic observation of prokaryotic specimen (bacteria)
4	Study of algae (Nostoc, Sargassum, Spirulina)
5	Fungi (Yeast, Penicillia, Tricoderma)
6	Bryophyte (Funaria, Riccia, Anthoceros
7	Pteridophyte (Selaginella)
8	Gymnosperms (Pinus)
9	Angiosperms (Sunflower, Maize)
10	Plant anatomy – Dicot and monocot root, stem, leaf.
11	Study of animal specimens of Sycon, Hydra, Liver fluke/ Taenia, Earthwarm/Nereis, ockroach, Pearl oyster/Pila, Starfish, Balanoglossus, Petromyzon, Labeo, Frog, Cobra, Parrot.

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-104T

Total Marks: 100
(80+20)

B. Sc. – I, Semester-I

Title of the Paper: Mathematical Sciences

Sr. No.	Topic Name	Lectures
1	**Unit- I: (Differential Calculus)** **(A) Differentiation** (i) Differentiation of the function of one variable (ii) Successive differntiation (iii) Leibnitz Theorem (iv) Taylor's theorem, (v) Taylor's series and Maclaurian's series, (vi) Series expansion of cosx, sinx, log(1+x), (1+x)n **(B)Numerical Differentiation** (i) Introduction, Definition (ii) Numerical differentiation using Newton's forward difference interpolation formula**,** (iii) Newton's backward difference interpolation formula**,** (iv) Sterling's Central difference interpolation formula **,** (v) Newton's divided difference formula.	12
2	**A) Partial Differentiation** (i) Introduction, (ii) Composite function, (iii) Chain Rule and Total derivative **,** (iv) Euler's theorem on homogeneous function of two variables . **B) Application of Partial Differentiation :** (i) Jacobian, (ii) Properties of Jacobian, (iii) Jacobian of Implicit function, (iv) Partial derivatives of Implicit function using Jacobian**,** (v) Errors and Approximation. Maxima and Minima of functions of two variables. **C). Vector Analysis** (i) Introduccton –Representation of Vectors in space , Scaler product and vector product, (ii) Derivative, Derivative of Triple Product and composite functiooon. (iii) Directional Derivative. (iv) Vector differential operator DEL,Gradient (v) Geometrical Intrpretation of DEL (vi) Divergence, Curl, Gauss, Stoke's,Green's Theorem	15
3	**Unit- III (Complex Numbers)** (i) Rectangular, polar and exponential forms of complex numbers,	08

	(ii) De-Moivre's Theorem, (iii) Powers, roots and log of complex numbers, (iv) Hyperbolic and circular functions and their relations (v) Properties of hyperbolic functions, (vi) Inverse hyperbolic functions.	
4	**Unit- IV (Linear Algebra)** (i) Eigen values and Eigen vectors, (ii) Characteristic equation, (iii) Cayley-Hamilton Theorem, (iv) System of homogeneous and non-homogeneous linear equations, (v) Condition for consistency.	10

References:

1. Differential Calculus: Shanti Narayan, S. Chand and Company, 2005
2. Finite differences and Numerical Analysis, H.C. Saxena , S.Chand and Company.
3. Complex Numbers, Algebra and Geometry: G. V. Kumbhojkar and H. V. Kumbhojkar, C. Jamnadas and Com. Bombay, 1982
4. Text Book of Matrices: Shanti Narayan and P. K. Mittal, S. Chand and Company, 2011
5. Higher Engineering Mathematics: B. S. Grival, Khanna Publishers, 2001.

Problem Session on above syllabus :(8+8+4+4 =24 hrs.)

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-105T

Total Marks: 100
(80+20)

B. Sc. - I, Semester-I

Title of the Paper: Electronic Devices and Circuits

Topic No.	Credits: 3	Lectures 45
1	**Unit- I : Passive components and Power sources** **Basic Circuit Components**: Colour code for resistors and capacitors, resistor specifications and types, Inductor specifications and types, capacitor specifications and types, Transformer and its types, Relays. **AC/ DC sources:** concept of constant current and constant voltage sources, parallel and series connections of resistor, capacitor, inductor and sources**.**	11
2	**Unit- II: Semiconductor Devices** **PN-Junction:** Semiconductor theory, Forward & reverse biasing of PN-Junction of Diode, Specifications and types of diodes (Zener, LED, point contact and photo diode). **BJT:** Transistor working, Basic configurations (CB, CE & CC), I/O characteristics of CEC, applications as an amplifier and switch. **FET:** JFET, MOSFET, IGBT (construction, working and I-V Characteristics) **Switching devices:** SCR and UJT (construction, working and I-V Characteristics)	12
3	**Unit- III: Electronics Circuits** **Rectifiers:** Half wave, Full wave and bridge rectifier. **Filters:** L, C, and CLC (π-filter), **Transistor amplifier:** Class A, B, AB and C amplifiers, single stage and multistage amplifiers, **Oscillators:** Transistorized RC, LC and crystal oscillators **Multivibrators:** Transistorized astable, monostable, and bistable multivibrators	11
4	**Unit- IV: Operational amplifier and its applications** Ideal difference amplifier, difference gain, common mode gain (CMRR), equivalent circuit of op-amp, block diagram of op-amp, ideal and practical characteristics, op-amp IC741 (case study), concept of virtual ground, Inverting and non-inverting amplifiers, voltage follower, adder, subtractor, comparator, integrator and differentiator.	11

References:

1. Electronic Principles - Malvino, Tata Mc-graw Hill publication, 7th edition
2. A Text Book of Applied Electronics -R. S. Sedha, S. Chand Publication
3. Electronic Devices and Circuits -Millman and Halkies, Tata Mc-graw Hill Publication
4. Electronic Devices and Circuits - Allen Mottershead, Tata Mc-graw Hill

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-114P

Total Marks: 50

B. Sc. - I, Semester-I

Title of the paper: Laboratory-course IV (ES and MS)

Sr. No.	(Credit 2)
1.	Colour code of resistor and capacitor
2.	I-V characteristics of PN-Junction diode
3.	Input and output characteristics of common emitter (CE) configuration
4.	Bridge rectifier
5.	Single stage CE amplifier
6.	Two stage transistor amplifier
7.	Hartly oscillator
8.	Wein-bridge oscillator
9.	Transistorized astable multivibrator
10.	Op-amp as inverting and non-inverting amplifier
11.	Op-amp as adder and subtractor
12.	Op-amp as integrator and differentiator
13-17	**Five Practical session on Mathematics syllabus**

Paper No: SNST-106T

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

B. Sc. - I, Semester-I

Title of the Paper: Basic concepts in communication

Topic No.	Non Credit Course	Lectures 10
1	**Unit- I (Communication Skills)** Introduction to Communication – Meaning and definition. a. Nature and Importance of Communication b. Characteristics of Communication c. Communication Cycle d. Barriers of Communication	3
2	**Unit- II (Types of Communication)** a. Types of Communication • Verbal Communication – Oral and Written • Non-Verbal Communication – Aspects of Body Language and Graphic Communication • Formal Communication • Informal Communication b. Technical communication and General Communication	3
3	**Unit- III (Language Skills)** a. Listening Skills b. Reading Skills c. Writing skills	2
4	**Unit- IV (Grammar)** a. Parts of Speech b. Tense c. Voices d. Direct and Indirect Speech e. Transformation of Sentences f. Word Formation	2

Reference Books:

1. *English for Technical Communication*, K.R. Lakshminarayanan, (Scitech Publications, Chennai.)
2. *Body Language*, Allan Pease, (Sheldon Press, London)
3. *A Communicative Grammar of English*, Geoffrey Leech, Jan Swartvik (ELBS – with Longman)
4. *Communication Skills for Engineers*, Sunita Mishra, C, Murali Krishna (Pearson Education).

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-201T

Total Marks: 100
(80+20)

B. Sc. – I, Semester-II

Title of the Paper: Optics, Thermodynamics, Electricity and Magnetism

Topic No.	Credits: 3	Lectures 45
1	**Unit- I** **1) Interference:** Interference in thin parallel films (reflected light only), Wedge shaped films, Newton's rings, its application for determination of wavelength of light. **2) Diffraction:** Types of diffraction, Elementary theory of plane diffraction grating (qualitative treatment only). **3) Polarization:** Production of polarized light, Malus Law, Phenomenon of double refraction	10
2	**Unit- II** **1) Thermometry:** Principle of thermometry, Mercury thermometer, Platinum resistance thermometer, thermocouple and thermopile, concept of cryogenics. **2) Ideal and Real gas:** Interpretation of temperature, Degree of freedom, Maxwell's law of equipartition of energy. Andrew's curve, critical constants, Relation between critical constants and Vander Waal's constants, reduced equation of state. **3) Transport Phenomena:** Molecular collisions, mean free path and collision cross section, Estimation of molecular diameter and mean free path (Elementary method), Clausius and Maxwell's equation for mean free path. Transport of momentum (viscosity), energy (thermal conduction), mass (diffusion).	15
3	**Unit- III** 1) Thermodynamics-I:Thermodynamical state, Thermodynamic equilibrium, Zeroth law of thermodynamics, First law of thermodynamics, reversible and irreversible changes, isothermal and adiabatic changes, Adiabatic relations, Work done during isothermal and adiabatic changes. 2) Thermodynamics-II: Second law of thermodynamics (different statements), Entropy, principle of increase of entropy in natural processes (conduction and free expansion of gas), Third law of thermodynamics.	10
4	**Unit- IV** **1) Dielectrics:** Polarisation of dielectrics and polarisation vector, Displacement vector, Electric vector, Relation between E, P and D vectors, Electric susceptibility of dielectrics. **2) A.C.Circuits:** Series LCR circuit, analysis of complex impedance, Reactance, Admittance, and Susceptance, Resonance in series circuit, Q-factor (definition only), A.C.Bridge-Owen's Bridge. **3) Ballistic Galvanometer:** Ballistic galvanometer, construction,	10

	theory, Damping correction, constants of B.G. (definitions only). **4) Magnetostatics**: Statement of Biot and Savert's law, Ampere's theorem, Magnetic induction due to straight solenoid and toroid.	

References:

1. Optics B.K.Mathur
2. Treaties on Heat – Saha and Shrivastav.
3. Heat and Thermodynamics – Brijlal and Subramanyam S. Chand and Co. Ltd, Delhi.
4. Kinetic Theory of gases – V.N. Kelkar.
5. Electricity and Magnetism – Yarwood
6. Electricity and Magnetism – Khare and Shrivastav

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-211P

Total Marks: 50

B. Sc. – I, Semester-II

Title of the paper: Laboratory-course I (PS)

Sr. No.	**(Credit 2)**
1.	Calibration of Spectrometer – unknown wavelength measurement.
2.	Newton's rings – measurement of wavelength.
3.	Plane diffraction grating.
4.	Verification of Kirchhoff's laws.
5.	Impedance of series LCR circuit.
6.	Bridge rectifier with Pi filter.
7.	Zener diode as voltage regulator.
8.	Output characteristics of transistor –CE mode
9.	Liquid lens.
10.	Thevenin's theorem.

Reference Books for Laboratory Course

1. College Practical Physics – Khanna and Gulati (S. Chand and Co. Ltd, Delhi).
2. Practical Physics – Gupta and Kumar (Pragati Prakation Meerat)
3. Advanced Level Practical Physics– J.M. Nelcon, J.M. Ogloom (EIBS).
4. Advanced Practical Physics–Worsnop and Flint.
5. A Text Book of Practical Physics-Shrinivasan and Balasubramanyam.
6. A Text Book of Practical Physics – Indu Prakashan and Ramkrishna.

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-202T

Total Marks: 100
(80+20)

B. Sc. – I, Semester-II

Title of the Paper: Fundamentals of Chemical Sciences -II

Topic No.	Credits: 3	Lectures 45
1	**Unit- I** Rate of reaction, Definition and units of rate constant. Factors affecting rate of reaction. (Nature of reactant, Concentration, pressure, temperature and catalyst.) Order and Molecularity of reaction, First order reaction: (Derivation not expected). Characteristics of first order reaction. Pseudo-unimolecular reactions. Examples: i) Hydrolysis of methyl acetate ii) Inversion of cane sugar. Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants. Characteristics of Second order reaction. Colloids: Optical properties, Tyndall effect, shape and size, stability, solvation, interaction between, colloids, solution, emulsions and gels	12
2	**Unit- II** Electronic Configuration of Elements, Aufbau principle, Hund's rule of Maximum multiplicity, (n+1) rules, shapes of s, p, and d orbital, Paulis exclusion Principle, Heisenberg's uncertainty principle and problems based on uncertainty in velocity and position. Atomic structure: Historical Development, Daltons atomic theory and limitations, discovery and properties of electron. e/m ratio of electron by Thomson's method Charge on electron by Millikens oil drop method, discovery of proton and properties, 'Thomson's Atomic model and its drawbacks. Rutherford's alpha particles scattering experiments, Rutherford's atomic model and its drawbacks. Prouty's hypothesis, Moseley experiment and its importance, discovery of proton and properties, atomic spectra. Ritz – combination principle.	10
3	**Unit- III** Periodic table Types of elements: inert gases, representative elements, transition and inner transition elements, Blocks in periodic table S, p, d & f blocks. Nomenclature of super heavy elements periodic law periodicity in properties throughout the periodic table a) Size and atoms of ions. b) Ionisation energy c) Electron affinity d) Electro negativity. iii) Shielding effect and shielding constant. Chemistry of Noble Gases, Introduction, Physical properties, Chemical properties , Clathrate compounds, Structure and Bonding of Xenon Compound XeF2, XeF4, XeO6, XeO4, XeO2 F2, [XeO6] -4 ,	10

	XeOF4. p- Block elements (Group 15, 16), Introduction, Electronic configuration, Allotropic forms of phosphorus and sulphur, Oxoacids of phosphorus and sulphur, Structures of HNO_2 , HNO_3 , H_3PO_3 ,H_3PO_4 , H_2SO_3 , H_2SO_4. Introduction, definition of related terms like oxidation, reduction, oxidizing agent and reducing agent ii) Balancing of redox reaction using ion electron method and oxidation number method iii) Rules to find oxidation number, iv) Problems based on equivalent weight of oxidant and reductants.	
4	**Unit- IV** Organic reaction mechanism: Nature of bond fission, arrow notations. Reactive Intermediates: Generation, Structure, Stability and reaction examples of Carbocation, Carbanions, Free Radicals, Carbenes, Nitrenes and Benzynes. Cycloalkanes , cycloalkenes and Alkadienes: methods of formation and properties. Aromaticity, Aromatic, Non aromatic, Anti aromatic, Pseudo aromatic, Structure of Benzene - Kekules structure, Resonance, M.O.T. Modern Theory of Aromaticity. Huckels Rule and its applications, General Mechanism of Electrophilic substitution, Aromatic Nucleophilic substitutions - orientation and reactivity, bimolecular displacement, Elimination–addition, Reactivity and orientation in Aromatic Nucleophilic substitutions. Preparation and applications of organic reagents: Ethyl acetoacetate, Diethyl malonate and Grignards reagent.	13

Reference Books:

1) University General Chemistry. By C.N. R. Rao. Mc Millan Publication.
2) Principles of Physical Chemistry. By Maron and Pruton 4th Ed. Oxford and IBH publication.
3) Physical Chemistry. By G.M. Barrow.
4) Principles of Physical Chemistry Puri, Sharma and Pathania, Vishal Publishing House, 44th Edition
5) Advanced Physical Chemistry Gurdeep Raj GOEL Publishing House, 36th Edition
6) Principles of Structure and reactivity by J.E. Huheey
7) Principles of inorganic chemistry by Puri, Sharma and Kalia
8) Concise Inorganic Chemistry by J. D. Lee
9) Advanced Inorganic Chemistry by Satya Prakash Tuli, Basu & Madan 6th edn
10) Organic Chemistry by Clayden, Oxford uni.press.
11) Organic Chemistry by Morrison & Boyd, 6th Edition.
12) A guide book to Mechanism in Organic Chemistry by Peter Sykes, 6th Edition.
13) I. L. Finar, 'Organic Chemistry '- Vol.- 6th Edition I, Pearson Education
14) Stereochemistry of Organic Compounds by D. Nasipuri.

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-212P

Total Marks: 50

B. Sc. – I, Semester-II

Title of the paper: Laboratory-course II (CS)

Sr. No.	**(Credit 2)**
1	Study of reaction between K2S2O8 and KI (Equal concentrations).
2	Determination of heat of ionization of weak acid by using polythene bottle.
3	Preparation and standardization of HCl and H2SO4 solutions from bulk.
4	Estimation of acetamide.
5	Identification of at least **three** organic compounds with reactions including **one** from acids, **one** from phenols, **one** from bases and **one/two** from neutrals from the list of compounds given below: **(exempt those mixtures which were identified for Semester-I)** **Acids :** Oxalic acid, Benzoic acid and Cinnamic acid. **Phenols :** β-Naphthol, Resorcinol. **Bases :** Aniline, p-Toluidine. **Neutrals :** Acetone, Ethyl acetate, Glucose, Chloroform, Chlorobenzene, m-Dinitrobenzene, Thiourea. **Note** : A systematic study of an organic compound involves the following operations which should be taught in details with reactions the detection of elements and functional group. Preliminary tests and Physical examination. • Physical constant. • Detection of Elements. • Detection of Functional group. • A Search into literature. • Special Test. • Summary. • Result.
6	**Qualitative Analysis: Spot Tests :** Detection of following cations using spot tests : Cu**2+**, Co**2+**, Ni**2+**, Fe**3+**, Zn**2+**, Mg**2+**, Al**3+**, Pb**2+**, Mn**2+** and Hg**2+**
7	Chromatography : Separation and identification of cations by Paper Chromatographic technique from the following

	mixtures: a) Ni^{2+} + Cu^{2+} b) Ni^{2+} + Co^{2+} c) Cu^{2+} + Co^{2+}

Reference Books for Laboratory Course

1. Practical book of Physical Chemistry: Nadkarni, Kothari & Lawande.
2. Experimental Physical Chemistry: A. Findlay.
3. Systematic Experimental Physical Chemistry: S. W. Rajbhoj, Chondhekar. (Anjali Publ.)
4. Experiments in Physical Chemistry: R. C. Das and B. Behra. (Tata Mc Graw Hill)
5. Advanced Practical Physical Chemistry: J. B. Yadav (Goel Publishing House.)
6. Practical Physical Chemistry: B. D. Khosala. (R. Chand & Sons)
7. Experiments in Chemistry: D. V. Jagirdar.
8. A Text Book of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis: A.I. Vogel (Third Ed.) (ELBS)
9. Vogels Text Book of Quantitative Chemical Analysis. (Longmann) ELBS Edition.
10. Vogels Text Book of Qualitative Chemical Analysis. (Longmann) ELBS Edition.
11. Hand book of Organic Qualitative Analysis: Clarke.
12. Comprehensive Practical Organic Chemistry – Qualitative Analysis by V. K. Ahluwalia, Sunita Dhingra. University Press. Distributor – Orient Longman Ltd.
13. Vogels Text Book of Inorganic Quantitative Chemical Analysis (Longman) ELBS Edition.
14. Vogels Text Book of Inorganic Qualitative Chemical Analysis (Longman) ELBS Edition.
15. Basic Concepts in Analytical Chemistry (Wiley Eastern Ltd.): S. M. Khopkar.

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-203T

Total Marks: 100 (80+20)

B. Sc. – I, Semester-II

Title of the Paper: Chemical basis of life, Biomolecules, Metabolism.

No	Topic	Lectures (45)
1	**UNIT I** **Carbohydrates:** Monosaccharides, Classification, Configurations and Conformations, Sugar Derivatives. Polysaccharides, Carbohydrate Analysis, Disaccharides. Structural Polysaccharides: Cellulose and Chitin. Storage Polysaccharides: Starch and Glycogen Glycosaminoglycans, Glycoproteins, Proteoglycans, Bacterial Cell Walls, Glycoprotein Structure and Function. (6L) Metabolic pathways: Glycolysis, TCA, oxidative Phosphorylation (4L)	**10**
2	**UNIT II** **Amino acids:** Amino acids, general properties and properties of amino acids, classification of amino acids, acid base properties of amino acids, uncommon amino acids and their roles, "Nonstandard" Amino Acids, Amino Acid Derivatives in Proteins, Specialized Roles of Amino Acids. (6L) **Metabolic pathways:** Amino Acid metabolism, Urea cycle(2L).	**8**
3	**UNIT III** **Proteins:** Overview of protein, Peptide bond, secondary structures Helical Structures, Beta Structures, Nonrepetitive Structures, Ramchandran Plot, Protein Tertiary and Quaternary Structures, Fibrous protein, globular proteins. Protein Stability, Electrostatic Forces, hydrogen Bonding Forces, Hydrophobic Forces, Disulfide Bonds. Protein Denaturation. (10L).	**10**
4	**UNIT IV** **Lipids:** Lipid Classification, Fatty Acids, Triacylglycerols, Glycerophospholipids, Sphingolipids Cholesterol, Properties of Lipid Aggregates, Micelles and Bilayers, Liposomes Bilayer Dynamics. Storage Lipids, Lipids as Signals, Cofactors, and Pigments. (10L) **Vitamins and Minerals:** Importance and role of vitamins, Types of vitamins, water soluble and fat soluble vitamins. Minerals, micro nutrients, macronutrients, roles and functions, disorders of mineral deficiency. (8L)	**17**

Reference Books:

1. Lehninger's Principles of Biochemistry by Nelson, D. L. and Cox, M. M.
2. Biochemistry by Lubert Stryer.
3. Principles of Protein Structure by Shulz and Schimer.
4. Complex Carbohydrate by Nathan Sharon.
5. Molecular biology by Watson
6. Genetics by Strickberger
7. Biochemistry - Garrett & Grisham
8. Practical Biochemistry- Wilson and Walker
9. Fundamentals of Biochemistry – J. L. Jain
10. Principals of Biochemistry- Voet and Voet
11. Molecular Biology by Glickpasternack
12. Molecular biolage Gerald Karp
13. Gene By Benjamin Levin
14. Genome by T.A. Brown
15. Animal Physiology- Nelson (Cambridge).
16. General and Comparative Physiology – Hoar (Prentice Hall).

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-213P

Total Marks: 50

B. Sc. – I, Semester-II

Title of the paper: Laboratory-course III (LS)

No	Credit 2
1	Determination of pH of fruit juice and soil sample.
2	Preparation of buffers (Phosphate buffer, acetate buffer) and determination of pH with pH meter.
3	Thermo chemistry Determination of heat of ionization of a weak acid.
4	Qualitative test for presence of carbohydrate.
5	Estimation of the Amount of Reducing Sugars
6	Estimation of Reducing Sugar by Somogyi's Method
7	Estimation of Sugar by Folin-Wu Method.
8	Estimation of Reducing Sugars by the Dinitro Salicylic Acid (DNS) Method.
9	Estimation of Protein by the Biuret Method.
10	Estimation of Protein by the FC-Method .
11	Protein Assay by Bradford Method
12	Estimation of Protein by the Lowry Protein Assay

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-204T

Total Marks: 100 (80+20)

B. Sc. – I, Semester-II

Title of the Paper: Computational Method- I

Sr. No.	Topic Name	Lectures
1	**Unit- I (Integration and Differential Equations)** (i) Integration of the function of one variable (i)Differential equations of first order and first degree, (ii) Variable separable form, (iii) Homogeneous differential equations and exact differential equations, examples of non-homogeneous equations, (iv) Condition for exactness, (v) Integrating factor, rules of finding integrating factors, (vi) Linear differential equations (vii) General solutions (viii) Applications of differential equations, Newton's law of Cooling, Kirchoff's law of electrical circuits, motion under gravity, simple harmonic motion.	10
2	**UNIT II: Numerical Solution of Ordinary Differential Equations of first order and first degree :** (i) Introduction (ii) Numerical Methods of solving first order first degree D.E. (iii) Solution by Picard's methods , (iv) Taylor's series method , (v) Euler's methods , (vi) Modified Euler's method, (vii) Runge-Kutta second and fourth order Method	06
3	**UNIT III: Integral Calculus** (i) Gamma and beta functions, (ii) Double integrals, evaluation of double integrals, (iii) Change of order of integration for two variables, (iv) Triple integrals, evaluation of triple integral, (v) Applications to areas and volumes	15
4	**UNIIT IV** **A.Transform Analysis** **Laplace Transform** (i)Definition, Transforms of elementary functions, (ii) Properties of Laplace transforms, transforms of derivatives, (iii) transforms of integral, **Inverse Laplace transform** (i) Inverse Laplace transforms by using partial fractions, (ii) Convolution theorem, (iii) Applications to linear differential equations	14

	with constant coefficients(Initial value problems) **B) Fourier series** (i) Definition, (ii) Dirichlet's Conditions for a Fourier expansion (iii) Detrmination of Fourier constant by using Euler's formulae, (iv) Fourier series in the interval (0 , 2Π), Fourier Expansion in the interval(- Π, Π) , (v)change of interval, (vi)expansion of odd and even periodic functions, (vii) Half range series	

References:

1) Introductory Methods of Numerical Analysis, S.S. Sastry, 3rd edition, Prentice Hall of India, 1999.
2) Integral Calculus: Shanti Narayan, S. Chand and Company, 2005
3) Differential Equations: G. S. Diwan and D. S. Agashe, Popular Prakashana, 4th Ed., 1975.
4) Introductory Course in Differential Equations: D. A. Murry, Orient Longman India, 1967.
5) J. N. Wartikar - A text book of Applied Mathematics Vol-I and II Pune Vidyarthi Griha Prakashan.
6) P. N. and J. N. Wartikar , Elements of Applied Mathematics.
7) B.S. Phadatare, U.H. Naik, P.V. Koparde, P.D .Sutar, P.D .Suryvanshi, M.C. Manglurkar, A Text Book Of Advanced Calculus Published by Shivaji University Mathematics Society (SUMS), 2005.
8) S.B. Kalyanshetti, S.D. Thikane, S.R .Patil, N. I. Dhanashetti, A Text Book Of Mathematics -Advanced Calculus Published by Sheth Publishers Pvt. Ltd. Mumbai
9) Dr. B. S. Grewal - Higher Engineering Mathematics, Khanna Publishers, Delhi.
10) G.V.Kumbhojkar, Engineering Mathematics II, C.Jamnadas and Co.
11) H. K. Dass - Advanced Engineering Mathematics.
12) M.R.Spiegel Advanced Calculus-Schaum Series

Problem Session on above syllabus :(8+8+4+4 =24 hrs.)

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-205T

Total Marks: 100
(80+20)

B. Sc. - I, Semester-II

Title of the Paper: Digital Electronics

Topic No.	Credits: 3	Lectures 45
1	**Unit- I : Basic Digital Electronics** **Number systems –** positional number systems, number system conversions, fractional numbers. Computer codes – BCD code, EBCDIC code, ASCII code. Computer Arithmetic – Binary arithmetic operations – addition, subtraction **Boolean algebra and logic circuits –** fundamentals, theorems of Boolean algebra, Boolean functions - minimization, complement, canonical forms, Logic gates – AND, OR, NOT, NAND, NOR, Logic circuits – building logic circuits from expressions, universal NAND/NOR gates, Ex-OR gate, Ex-OR gate as Controlled inverter **Basic computer organization:** Input unit, output unit, storage unit, control unit, ALU, Memory – main memory, storage, memory organization, types of memories, cache memory.	12
2	**Unit- II: Combinational and Sequential Digital Circuits** **Design of combinational circuits –** half adder, full adder, half substractor, full substractor a parallel binary adder, Decoder: 2 to 4 line decoder, 3 to 8 line and 4 to 16 line decoder, Encoder: Decimal to BCD encoder and Priority encoder, Multiplexers: 2 to 1, 4 to 1, 8 to 1 and 16 to 1 Multiplexers, Demultiplexers: 1 to 4 line, 1 to 8 line and 1 to 16 line. **Design of Sequential circuits -** flip flops: RS flip flop, T- flip flop, D-Flip flop, JK flip flop, counters: basic counter operation asynchronous and synchronous counters, shift registers: shift registers operations, types of shift registers: SISO, SIPO, PISO, PIPO.	12
3	**Unit- III: Digital Integrated Circuits and VHDL Programming** **Digital integrated circuits:** Logic levels, propagation delay time, power dissipation fan-out and fan-in, noise margin, logic families and their characteristics DTL, TTL, CMOS and ECL integrated circuits and their performance comparison, open collector and tristate gates and buffers. **VHDL Programming:** Introduction to VHDL, feature and capabilities, entity, architecture and levels of abstractions **Case study using VHDL:** Basic Gates, RS flip flop, Adder, Multiplixer and counters	11

4	**Unit- IV: CMOS Integrated Circuits** **Manufacturing CMOS Integrated Circuits:** The Silicon Wafer, Photolithography technique, Some Recurring Process Steps, Simplified CMOS Process Flow, Design Rules — The Contract between Designer and Process Engineer **Packaging Integrated Circuits:** Package Materials, Interconnect Levels, Thermal Considerations in Packaging, Perspective — Trends in Process Technology, Short-Term Developments and Long Term Developments.	10

References:

1. Computer fundamentals, Pradeep K. Sinha, BPB Publications.
2. Digital Computer Fundamentals, Thomas Bartee, TMH
3. Logic and Computer Design Fundamentals, Third Edition, Morris Mano, PHI
4. Digital Integrated Circuits: A Design Perspective, Jan M. Rabaey, Prentice-Hall of India
5. Introduction to VHDL: Douglas L. Perry, Tata McGraw Hill
6. Modern Digital Electronics, R. P. Jain, Tata McGraw Hill

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

Paper No: SNST-214P

Total Marks: 50

B. Sc. I, Semester-II

Title of the paper: Laboratory-course IV (MS and ES)

Sr. No.	(Credit 2)
Electronics	
1.	Study of Basic gates
2.	Verification of De-Morgan's theorem
3.	Study of Adder and Substractor
4.	Study of flip-flops (RS, D and JK)
5.	Study of shift register
6.	Study of up –down counters
7.	Study of ring and Johnson counter
8.	Study of Multiplexer and Demultiplexer
9.	Design of Basic Gate using VHDL
10.	Design of half Adder and Full Adder using VHDL
Mathematics	
1.	Numerical Differentiation
2.	Numerical Methods for solution of Linear Equations: (Using Calculators) a) Gaussian Elimination Method b) Gauss – Jorden (Direct)Method c) Gauss Seidel (Iterative)Method.
3.	Jacobian and Extreme values for two variables , Error and Approximation
4.	Diveregence , Curl & Gradient (examples**)**
5.	Application of Laplace Transform

Paper No: SNST-206T

SHIVAJI UNIVERSITY, KOLHAPUR
School of Nanoscience and Technology
(5 year integrated multidisciplinary 10 semester course)

B. Sc. - I, Semester-II

Title of the Paper: Communication in Practice

Topic No.	Non Credit Course	Lectures 10
1	**Unit- I (Communication Skills)** a. Introduction to Communication – Meaning and definition. b. Nature and Importance of Communication c. Characteristics of Communication d. Communication Cycle e. Barriers of Communication	3
2	**Unit- II (Types of Communication)** a. Types of Communication • Verbal Communication – Oral and Written • Non-Verbal Communication – Aspects of Body Language and Graphic Communication • Formal Communication • Informal Communication b. Technical communication and General Communication.	3
3	**Unit- III Language Skills:** a. Listening Skills b. Reading Skills c. Writing skills	2
4	**Unit- IV (Grammar)** a. Parts of Speech b. Tense c. Voices d. Direct and Indirect Speech e. Transformation of Sentences f. Word Formation	2