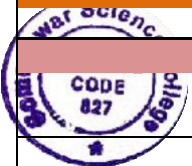


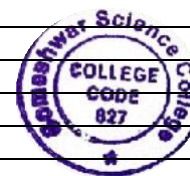
Course Outcomes (COs) of Science Faculty



Department of Physics

**F.Y. B.Sc.
(CBCS 2019)**

SEMESTER I	PHY-111 Mechanics and Properties of Matter	CO1. An understanding of Newton's laws of motion and applying them in calculations of the Motion of simple
	Paper I	CO2. Understanding the concepts of energy, work, power.
		CO3. Understanding of the concepts of conservation of energy, surface tension and viscosity the concepts of elasticity and be able to perform calculations using them.
SEMESTER I	PHY-112 Physics Principles and Applications	CO 1. To understand the general structure of atom, spectrum of hydrogen atom.
	Paper II.	CO 2. To understand the atomic excitation and LASER principles
		CO 3. To understand the bonding mechanism and its different types.
		CO 4. To demonstrate an understanding of electromagnetic waves and its spectrum.
		CO 5. Understand the types and sources of electromagnetic waves and applications.
		CO 6. To demonstrate quantitative problem solving skills in all the topics covered.
SEMESTER I	PHY-113 Physics Laboratory 1A	CO1. Exposure of techniques of handling simple instruments and also ascertain mechanical and thermal properties of matter.
	Paper III	CO 2. Acquire technical and manipulative skills in using laboratory equipment, tools, and materials.
		CO3. Demonstrate an ability to collect data through observation and/or experimentation and interpreting data.
SEMESTER II	PHY-121 Heat and Thermodynamics	CO 1. Understanding of the: properties and relationships between the thermodynamic properties of a pure substance ideal gas equation and its limitations, real gas
	Paper I	CO 2. The laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process, heat engines and calculate thermal efficiency.
		CO 3. Analyze the refrigerators, heat pumps
SEMESTER II	PHY-122 Electricity and Magnetism	CO1. To understand the concept of the electric force, electric field and electric potential for stationary charges.
	Paper II.	CO 2. Able to calculate electrostatic field and potential of charge distributions using Coulomb's law and Gauss's law.
		CO3. To understand the dielectric phenomenon and effect of electric field on dielectric
		CO4 To Study magnetic field for steady currents using Biot-Savart and Ampere's Circuital laws
		CO5. To study magnetic materials and its properties.
		CO6. Demonstrate quantitative problem solving skills in all the topics covered.
SEMESTER II	PHY-123 Physics Laboratory 1B	CO1. Exposure of techniques of handling simple instruments and also ascertain mechanical and thermal properties of matter.
	Paper III	
		CO 2. Acquire technical and manipulative skills in using laboratory equipment, tools, and materials.
		CO3. Demonstrate an ability to collect data through observation and/or experimentation and interpreting data.
		CO 4 Demonstrate an understanding of laboratory procedures including safety, and scientific methods.
S.Y. B.Sc. CBCS-2019		
(Semester-III)	PHY-231: Mathematical Methods in	CO 1 Understand the complex algebra useful in physics courses.



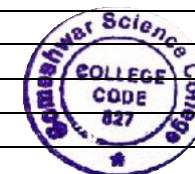
	Physics-I	
		CO 2. Understand the concept of partial differentiation.
		CO 3. Understand the role of partial differential equations in physics.
		CO4. Understand vector algebra useful in mathematics and physics.
		CO5. Understand the singular points of differential equation.
	PHY-232(A): Electronics-I	CO1 Apply different theorems and laws to electrical circuits.
		CO2. Understand the relations in electricity.
		CO3. Understand the parameters, characteristics and working of transistors.
		CO4 Understand the functions of operational amplifiers.
		CO5. Design circuits using transistors and applications of operational amplifiers.
		CO 6 Understand the Boolean algebra and logic circuits.
		OR
	PHY-232(B): Instrumentation	CO1. Understand the functions of different instruments.
		CO2. Use different instruments for measurement of parameters.
		CO3. Design experiments using sensors.
	PHY-233: Physics Laboratory-2A	CO1 Use various instruments and equipment
		CO2 Design experiments to test a hypothesis and/or determine the value of an unknown quantity
		CO3 Investigate the theoretical background of an experiment.
		CO4 Setup experimental equipment to implement an experimental approach.
		CO5 Analyze the data, plot appropriate graphs and reach conclusions from data analysis.
		CO6 Work in a group to plan, implement and report on a project/experiment.
		CO7 Keep a well-maintained and instructive laboratory logbook.
(Semester-IV)	PHY-241: Oscillations, Waves and Sound	CO 1. To study underlying principles of oscillations and its scope in development.
		CO 2. To understand and solve the equations / graphical representations of motion for simple harmonic, damped, forced oscillators and waves.
		CO 3. To explain oscillations in terms of energy exchange with various practical applications.
		CO4 To solve numerical problems related to undamped, damped, forced oscillations and superposition of oscillations.
		CO5. To study characteristics of sound, decibel scales and applications.
	PHY-242: Optics	CO 1. Acquire the basic concept of wave optics.
		CO 2 Describe how light can constructively and destructively interfere.
		CO 3. Explain why a light beam spread out after passing through an aperture
		CO 4. Summarize the polarization characteristics of electromagnetic wave
		CO 5. Understand the operation of many modern optical devices that utilize wave optics
		CO 6. Understand optical phenomenon such polarization, diffraction and interference in terms of the wave model
		CO 7 Analyze simple example of interference and diffraction
	PHY-243: Physics Laboratory-2B	CO 1 Use various instruments and equipment.
		CO2. Design experiments to test a hypothesis and/or determine the value of an unknown quantity.
		CO3. Investigate the theoretical background of an experiment.

		CO4. Setup experimental equipment to implement an experimental approach.
		CO5. Analyze the data, plot appropriate graphs and reach conclusions from data analysis.
		CO 6 Work in a group to plan, implement and report on a project/experiment.
		CO 7 . Keep a well-maintained and instructive laboratory logbook

Department of Mathematics

F.Y. B.Sc.
CBCS-2019

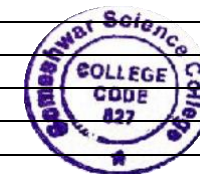
Semester-I	MT 111- Algebra	CO1. The course aids in basic understanding of the integers , polynomials , system of linear equations , eigenvalues & eigenvectors .
	Paper I	CO2.This Course build foundation of mathematics in sets,relations,congruences,
		CO3. Study the basics of complex numbers and their properties
		co 4 The student develops theoretical, applied and computational skills
	MT 112: CALCULUS - I	CO1. Study of calculus of real valued functions of real variables .
	Paper II	CO2. To study basic properties of real numbers to use it in theorems
		CO3. To visualize concept through maxima software
		CO4. To concepts of calculus through maxima software
		CO4.The student develops theoretical, applied and computational skills
	MT 113: Mathematics Practical	CO1.Imparting skill to solve problems.
		CO2 To Solve Problems in Algebra using maxima software
		CO3 To Solve Problems in calculus I using maxima software

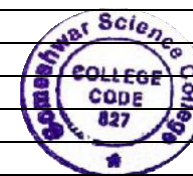


S.Y. B.Sc.
CBCS-2019

S.Y. B.Sc	Multivariable Calculus.	CO1.Study calculus of functions of several variables.
Semester-I	Paper I	CO2 visualize the concept of multivariable calculus through maxima software
		CO3. Understand the Applications of double and triple integration.
		CO4 Solve Double Triple Integral Using Maxima Software
	MT-232(A): Numerical Methods and Its Applications	CO1. Study Need of Numerical Techniques.
	Paper II	CO2.Finding of the solution of transcendental equations and polynomial equations by Numerical Methods.
		CO3.Fitting of a curve to data by Least Square Method.
		CO4.Interpolation.
		CO5.Numerical Integration.
		CO6.Finding of the solution of differential equations of first order and first degree by Taylors series Method,
		CO 7 To Solve Problems Using Maxima software
	MT-233: Mathematics Practical based on MT-231 and MT232	CO 1 To Visualize Domain and range of function of several variables using maxima Software
	Paper III	CO 2 To Solve the problems on Limits and Partial derivatives using maxima Software
		CO 3 using maxima Software understand the application of Double & Triple integral
		CO 4 Study of Numerical Techniques using maxima Software.

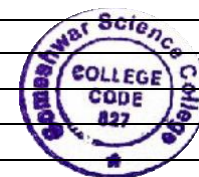
Semester-II	MT-241:Linear Algebra	CO1.Knowledge of vector spaces and subspaces.
	Paper I	CO1.Finding of the basis and dimension of vector spaces.
		CO1.Knowledge and study Linear Operators on vector spaces and their properties.
		CO1.Study Inner Product spaces and properties, Gram-Schmidt Process.
	MT-242(A): Vector Calculus	CO1. Find the vector equations of lines and planes.
	Paper II	CO2. Understand the parametric equations of curves and surfaces.
		CO3. Find the gradient of a function.
		CO4. Use the gradient operator to calculate the directional derivative of a function.
		CO5 Calculate the unit normal at a point on a surface.
		CO6. Understand the various integral theorems relating line, surface and volume integrals.
	MT-243: Mathematics Practical based on MT-241 and MT-242	CO1.To Solve the Problems based on Linear Algebra & Vector Calculus
	Paper III	CO2.To Solve the Problems based on Linear Algebra using maxima Software
		CO3.To Solve the Problems based on Vector Calculus using maxima Software
<u>T.Y. B.Sc.</u> <u>CBCS-2019</u>		
T.Y. B.Sc.	Metric Spaces	CO1. Define a metric space, describe the standard examples of metric spaces from the course and demonstrate that they meet the definition.
Semester-v	Paper I	CO2. Define open/closed balls and open/closed sets and understand their properties (e.g., closure under union, etc.).
		CO3. Define continuous function between metric spaces and demonstrate equivalence of alternative definitions
		CO3demonstrate that certain metric spaces are complete, state and be able to apply the contraction mapping theorem.
		CO4. Knowledge and study of connectedness and completeness property of Metric Spaces.
	Real Analysis I	CO1.Knowledge and study Sets and Functions.
	Paper II	CO2. describe the fundamental properties of the real numbers that underpin the formal development of real analysis;
		CO3 demonstrate an understanding of the theory of sequences and series
	Problem course based on paper I & II	CO1. Imparting skill to solve problems.
	Paper III	CO1. Develop the Critical thinking & to Solve difficult problems in Real Analysis & Metrics Spaces
	Group Theory	CO1.Learning of groups and subgroups.
	Paper IV	CO2.Knowledge and study of Permutation groups.
		CO3.Knowledge and study Homomorphism of groups and factor groups.
	Ordinary Differential Equations Paper V	CO1.Linear Differential Equations with constant coefficients.
		CO2.Non Homogeneous differential Equations
		CO3.Power series solution of Differential Equations.
		CO4.System of first order equations.
	Problem course based on paper III & IV Paper VI	CO1.Imparting skill to solve problems.
		CO2. Develop the Critical thinking & to Solve difficult problems in Group Theory & ODE





	Operational Research.	CO1. Knowledge and study Modeling with linear programming ,
	Paper VII	CO2.Simplex Method , Duality,
		CO3.Transportation Model , The assignment model .
	Number Theory	CO1.Knowledge and study of Divisibility of integers ,
	Paper VIII	CO2. Understand the Concept of Congruences ,
		CO3. Understand the Concept of Greatest Integer Function ,
		CO4. Understand the Concept of Quadratic Resiprocity ,
		CO5. Understand the Concept of Diophantine Equations .
	Practical Course IX	Imparting skill to solve problems.
		Develop the Critical thinking & to Solve difficult problems in operation Research & Number Theory
Semester-VI	Complex Analysis	CO1 Understand the significance of differentiability of complex functions leading to the understanding of Cauchy-Riemann equations.
	Paper I	CO2. Evaluate the contour integrals and understand the role of Cauchy-Goursat theorem and the Cauchy integral formula.
		CO3. Expand some simple functions as their Taylor and Laurent series, classify the nature of singularities, find residues and apply Cauchy Residue theorem to evaluate integrals..
		CO4 Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem.
	Real Analysis II	CO1.some of the families and properties of Riemann integrable functions, and the applications of the fundamental theorems of integration. ii) iv)
	Paper II	CO2. beta and gamma functions and their properties.
		CO3. recognize the difference between pointwise and uniform convergence of a sequence of functions.
		CO4 illustrate the effect of uniform convergence on the limit function with respect to continuity, differentiability, and integrability.
	Problem Course based on	Imparting skill to solve problems.
	Paper I & II Paper III	Develop the Critical thinking & to Solve difficult problems in operation Research & Number Theory
	Ring Theory	CO1. The fundamental concept of Rings, Fields, subrings, integral domains and the corresponding morphisms.
	Paper IV	CO2. Learn in detail about polynomial rings, fundamental properties of finite field extensions, and classification of finite fields.
		CO3 Appreciate the significance of unique factorization in rings and integral domains.
	Partial Differential Equations	CO1. formulate, classify and transform partial differential equations into canonical form.
	Paper V	CO2. solve linear partial differential equations using various methods and apply these methods in solving some physical problems.
		CO3 solve Laplace equations using various analytical methods demonstrate uniqueness of solutions of certain kinds of these equations.
	Problem course based on	CO1.Imparting skill to solve problems .
	Paper III & IV Paper VI	
	Optimization Techniques	CO1. understand fundamentals of Network Analysis using CPM and PERT.
	Paper VII	CO2. solve a sequencing Problem for various jobs and machines.

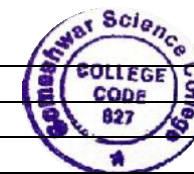
	Computational Geometry	CO1. construct algorithms for simple geometrical problems.,
	Paper VIII	CO2. characterize invariance properties of Euclidean geometry by groups of transformations.
		CO3. describe and construct basic geometric shapes and concepts by computational means.
	Practical Course IX	CO1.Imparting skill to solve problems
Department of Electronics		
F.Y. B.Sc.		
CBCS-2019		
Semester I	Paper I: EL- 111: Basics of Applied Electronics	CO1 To identify different parameters/functions/specifications of components used in electronic circuits
		CO2 To solve problems based on network theorems
		CO3 To perform simulations using simulator for analyzing network performance
		CO4 To understand few electronic systems
	Paper II: EL- 112: Electronic Devices and Circuits	CO1 To analyze performance parameters based on study of characteristics of electronic devices like diode, transistors etc
		CO2 To choose proper electronic devices as per the need of application
		CO3 To perform simulations for designing and analyzing diode/transistor circuits
		CO4 To build and test the circuits like street light controller using electronic devices
	EL- 113: ELECTRONICS LAB IA	To identify different components and devices as well as their types
		To understand basic parameters associated with each device
		To know operation of different instruments used in the laboratory
		To connect circuit and do required performance analysis
		To compare simulated and actual results of given particular experiment
Semester II	Paper I: EL-121: Fundamentals of Digital Electronics	To solve problems based on inter conversion of number systems
		To reduce the expression using Boolean theorems
		To reduce expressions using K maps in SOP and POS forms
		To understand how to use flip flops to build modulus counter
		To familiarize with applications of counters like ring counter or event counter
	Paper II: EL- 122: Analog and Digital Device applications	To compare different opamps as per specifications or performance parameters
		To understand opamp circuits and its usefulness in different applications
		To know operating principle of IC 555 in different configurations
		To understand different types of DAC and their performance parameters
		To study different types of ADC and their performance parameters



	EL- 123: ELECTRONICS LAB IB	To connect opamp circuits and analyze the output
		To build application circuits of opamp
		To design the output frequency of IC 555 as astable/monostable multivibrator
		To compare simulated and actual results of given circuit

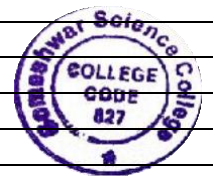
**F.Y. B.Sc.(CS)
(2019 credit Pattern)**

Semester I	ELC-111: Semiconductor Devices and Basic Electronic Systems	1. To study various types of semiconductor devices
		2. To study elementary electronic circuits and systems
	ELC 112: Principles of Digital Electronics	1. To get familiar with concepts of digital electronics
		2. To learn number systems and their representation
		3 To understand basic logic gates, Boolean algebra and K-maps
		4. To study arithmetic circuits, combinational circuits and sequential circuits
	ELC-113: ELECTRONICS LAB IA	Measurement of AC/DC voltage and Current – on different ranges •
		Measurement of R & C
		Testing of Diodes & Transistors
		Understand how to use Signal Generator, CRO ••
		Study of front panel controls of both
		Measurement of amplitude and frequency of Sine/Square waveform
		Measurement of Phase with the help of RC circuit
Semester II	ELC 121: Instrumentation Systems	1. To study Instrumentation System
		2. To study various blocks of Instrumentation System
		3. To study Smart Instrumentation System
	ELC 122 : Basics of Computer Organisation	1. To get familiar digital sequential circuits
		2. To study Basic computer Organization
		3. To study Memory architecture
	ELC-123: Electronics Lab IB	1. Use of LDR to control light intensity. 7. Build and test adder and subtractor circuits using OPAMP
		2. Study of PIR and tilt sensor
		3. Study of stepper motor
		4. Use of OPAMP as comparator and its use in DC motor driving
		5 Build and test Inverting and non inverting amplifier using OPAMP

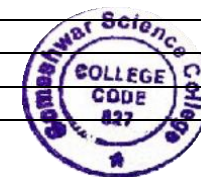


**S.Y. B.Sc.
(2019 credit Pattern)**

Semester-III	EL-231: Paper – I: Communication Electronics	CO1. Understand different blocks in communication systems, types of noise in communication systems and its different parameters
		CO2 Understand need of modulation, modulation process and amplitude modulation and demodulation methods
		CO3 Analyse generation of FM Modulation and demodulation methods and comparison between amplitude and frequency modulation
		CO4. Identify different radio receivers and their performance parameters.
		CO5 Solve problems based on AM and FM performance parameters
		CO6 Compare pulse modulation techniques such as PAM, PPM, PWM and compare TDM and FDM techniques used in communication
		CO7 Understand need of sampling and sampling theorem as well as know about performance parameters of digital communication
		CO8 Analyze difference between ASK, FSK , PSK as well as PCM and its applications
	EL-232: Paper- II: Digital Circuit Design	CO1 Distinguish between different logic families based on their performance parameters
		CO2 Analyze basic combinational logic circuits for simple applications
		CO3 Design combinational logic circuits using K maps for identified applications
		CO4 Design Sequential logic circuits using state diagram, excitation table for identified applications
		CO5 Understand and compare different types of ADC and their performance parameters using data sheets/manuals
		CO6 Understand and compare different types of DAC and their performance parameters using data sheets/manuals
	EL-233: Paper- III: Practical Course	CO1 Describe and explain the techniques of generation of AM/ FM and demodulation
		CO2 Design FSK generation using standard IC XR 2206 referring data manuals
		CO3 Describe and explain the TDM/ FDM generation technique
		CO4 Demonstrate PPM/PWM/PAM and PCM techniques using standard circuits in data manuals
		CO5 Design and build minimum complexity digital circuits using logic gates
		CO6 Design and analyze different combinational and sequential logic circuits using standard ICs in data manuals
		CO7 Design ADC/ DAC using data manuals and study its performance parameters
Semester-IV	EL-241: Paper - I: Analog Circuit Design	CO1 Design single/multistage amplifier using transistor and analyze their frequency response base on gain-bandwidth product due to coupling /bypass capacitors
		CO2 Classify and compare different power amplifiers
		CO3 Understand and design push pull amplifier and need of heat sinks
		CO4 Distinguish between Opamp Feedback circuits based on their configurations
		CO5 Analyze the effect of negative and positive feedback on characteristics of Opamp
		CO6 Understand and analyze the need of positive feedback in oscillator circuits
		CO7 Design , develop and build circuits for identified applications
	EL-242: Paper II: Microcontroller and Python Programming	CO1 Identify the features and architectural details of microcontroller(arduiono)
		CO2 Write code/program using open source programming language(arduino) for basic identified applications
		CO3 Understand programming basics of python programming language
		CO4 Understand special features of python programming language such as importing modules, directory, tupules
		CO5 Design , build and implement applications using arduino and python



	EL-243: Paper- III: Practical Course	CO1 Describe and explain the design procedure of different types of active filters and analyze its frequency response
		CO2 Demonstrate positive feedback for oscillator circuits using standard ICs
		CO3 Describe and explain design procedure for two stage amplifiers and application circuits
		CO4 Design practical circuits for identified applications
		CO5 Develop working setup and write programs using programming techniques of arduino
		CO6 Demonstrate and explain interfacing hardware to arduino microcontroller
		CO7 Solve problems using programming techniques of python
S.Y. B.Sc.(CS) (2019 credit Pattern)		
Semester-III	Paper-I: Microcontroller Architecture & Programming (ELC 231)	1. To write programs for 8051 microcontroller
		2. To interface I/O peripherals to 8051 microcontroller
		3. To design small microcontroller based projects
	Paper-II, Digital Communication and Networking, ELC- 232	1. Define and explain terminologies of data
		2. Understand the impact and limitations of various digital modulation techniques
		3. To acknowledge the need of spread spectrum schemes
		4. Identify functions of data link layer and network layer while accessing communication link communication
		5. To choose appropriate and advanced techniques to build the computer network
	Paper III, Practical Course (ELC-233)	1. To design and build his/her own microcontroller based projects
		2. To acquire skills of Embedded C programming
		3. To know multiplexing and modulation techniques useful in developing wireless application
		4. Do build and test own network and do settings.
Semester-IV	Paper I : Embedded System Design (ELC-241)	1. To understand the difference between general computing and the Embedded
		2. To know the fundamentals of embedded systems.
		3. Understand the use of Single board Computer (Such as Raspberry Pi) for an embedded system application
		4. Familiar with the programming environment to develop embedded systems and their interfaces with peripheral devices. systems
		5. To develop familiarity with tools used to develop in an embedded environment.
	Paper II: Wireless Communication and Internet of Things (ELC242)	1. Know working of wireless technologies such as Mobile communication, GSM, GPRS
		2. Become familiar with 3G and 4G Cellular Network Technologies for Data Connections.
		3. Understand working principles of short range communication application
		4. Get introduce to upcoming technology of Internet of Things
		5. Explore themselves and develop new IoT based applications

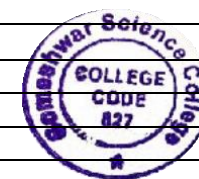


	Paper III, Practical Course (ELC-243)	1. To design and develop own smart applications using Rasberry-Pi
		2. To write Python program for simple applications
		3. To build own IoT based system

Department of Statistics

**F.Y. B.Sc.
(2019 credit Pattern)**

Semester I	ST – 111: Descriptive Statistics I	(i) to compute various measures of central tendency, dispersion, skewness and kurtosis (ii) to analyze data pertaining to attributes and to interpret the results.
	ST – 112: Discrete Probability and Probability Distributions I	(i) to distinguish between random and non-random experiments. (one or two dimensional) in the given situation. (ii) to find the probabilities of events (iii) to obtain a probability distribution of random variable
	ST – 113 : PRACTICALS	(i) to use various graphical and diagrammatic techniques and interpretation. (ii) to analyse data pertaining to discrete and continuous variables and to interpret the results, (iii) to compute various measures of central tendency, dispersion, skewness and kurtosis (iv) to interpret summary statistics of computer output. (v) to summarize and analyze the data using computer.



Semester II	ST - 121: Descriptive Statistics II	(i) to compute the correlation coefficient for bivariate data and interpret it (ii) to fit linear, quadratic and exponential curves to the bivariate data to investigate relation between two variables. (iii) to compute and interpret various index numbers.
	ST – 112: Discrete Probability and Probability Distributions II	(i) to apply standard discrete probability distribution to different situations. (ii) to study properties of these distributions as well as interrelation between them.
	ST – 123 : Practicals	(i) to compute correlation coefficient, regression coefficients (ii) to compute probabilities of bivariate distributions (iii) to fit binomial and Poisson distributions (iv) to compute probabilities of bivariate distributions (v) to draw random samples from Poisson and binomial distributions

**F.Y. B.Sc.(CS)
(2019 credit Pattern)**

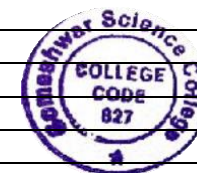
Semester I	CSST 111 :Mathematical Statistics	CO1. Concepts and terminology in Statistics and covers basic tools and methods. CO2. Understanding the concepts and ability to apply statistical tools and techniques CO3 to obtain a probability distribution of random variable
	CSST 112 :Mathematical Statistics	CO1. Concepts and terminology in Statistics and covers basic tools and methods. CO2. Understanding the concepts and ability to apply statistical tools and techniques CO3 to obtain a probability distribution of random variable

	CSST113: Statistics Practical	i) To tabulate and make frequency distribution of the given data
		ii) To use various graphical and diagrammatic techniques and interpret.
		iii) To compute various measures of central tendency, dispersion, Skewness and kurtosis
		iv) To fit the Binomial and Poisson distributions
		v) To compute the measures of attributes.
		vi) The process of collection of data, its condensation and representation for real life data
		vii) To study free statistical softwares and use them for data analysis in project

Department of Chemistry

**F.Y. B.Sc.
(2019 credit Pattern)**

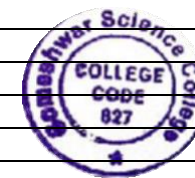
Semester I	CH- 101: Physical Chemistry	1. To understand basic concept of physical, organic and Inorganic chemistry..
		2. 1. Students will be able to apply thermodynamic principles to physical and chemical process
		3. Calculations of enthalpy , Bond energy, Bond dissociation energy , resonance energy
		4. Exergonic and endergonic reaction
		5. Gas equilibrium, equilibrium constant and molecular interpretation of equilibrium constant
		6. Van't Haff equation and its application
		7. Concept to ionization process occurred in acids, bases and pH scale
		8. Related concepts such as Common ion effect hydrolysis constant, ionic product, solubility product
CH- 102: Organic Chemistry	1. The students are expected to understand the fundamentals, principles, and recent developments in the subject area	2. It is expected to inspire and boost interest of the students towards chemistry as the main subject
		3. To familiarize with current and recent developments in Chemistry.
		4. To create foundation for research and development in Chemistry.
CH- 103: Chemistry Practical Course I	1. Importance of chemical safety and Lab safety while performing experiments in laboratory	2. Determination of thermochemical parameters and related concepts
		3. Techniques of pH measurements
		4. Preparation of buffer solutions
		5. Elemental analysis of organic compounds (non instrumental)
		6. Chromatographic Techniques for separation of constituents of mixtures
Semester II	CH-201: Inorganic Chemistry	1. Various theories and principles applied to reveal atomic structure
		2. Origin of quantum mechanics and its need to understand structure of hydrogen atom
		3. Explain rules for filling electrons in various orbitals- Aufbau's principle, Pauli exclusion principle, Hund's rule of maximum multiplicity.
		4. Discuss electronic configuration of an atom and anomalous electronic configurations
		5. Describe stability of half-filled and completely filled orbitals.
		6. Attainment of stable electronic configurations.
		7. Define various types of chemical bonds- Ionic, covalent, coordinate and metallic bond
CH- 202: Analytical Chemistry	1. Introduction to Analytical Chemistry	2. Calculations used in Analytical Chemistry



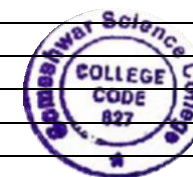
		3 Qualitative Analysis of Organic Compounds
		4. Chromatographic Techniques – Paper and Thin layer Chromatography
		5. pH metry
	CH- 203: Chemistry Practical –II	1.After completing the course work learner will be acquired with knowledge of chemical energetics, Chemical equilibrium and ionic equilibria.
		2.Students will learn Fundamentals of organic chemistry, stereochemistry (Conformations, configurations and nomenclatures) and functional group approach for aliphatic hydrocarbons.
		3.Students will learn quantum mechanical approach to atomic structure, Periodicity of elements, various theories for chemical bonding.
		4.Students will know about basics of analytical chemistry, some techniques of analysis and able to do calculations essential for analysis

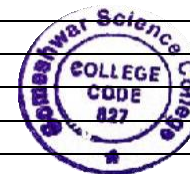
**S.Y. B.Sc.
(2019 credit Pattern)**

Semester III	CH-301: Physical and Analytical Chemistry	1.Define / Explain concept of kinetics, terms used, rate laws, molecularity, order..
		2. Explain factors affecting rate of reaction
		3. Explain / discuss / derive integrated rate laws, characteristics, expression for half-life and examples of zero order, first order, and second order reactions.
		4 Discuss factors influencing adsorption, its characteristics, differentiates types as physisorption and Chemisorption
		5 Classification of Adsorption Isotherms, to derive isotherms.
		6 Explanation of adsorption results in the light of Langmuir adsorption isotherm, Freundlich's adsorption Isotherm and BET theory
		7. Define, explain and compare meaning of accuracy and precision.
		8 Apply the methods of expressing the errors in analysis from results.
		9 Explain why indicator show colour change and pH range of colour change
		10.To prepare standard solution and b. perform standardization of solutions.
	CH-302: Inorganic and Organic Chemistry	3. Explain formation of different types of MO's from AO's.
		4. Distinguish between atomic and molecular orbitals, bonding, anti-bonding and nonbonding molecular orbitals.
		5. Draw and explain MO energy level diagrams for homo and hetero diatomic molecules. Explain bond order and magnetic property of molecule
		6. Explain Werner's theory of coordination compounds. Differentiate between primary and secondary valency. Correlate coordination number and structure of complex ion.
		7. Apply IUPAC nomenclature to coordination compound.
		8. Give the mechanism of reactions involved
		9. Explain /Discuss important reactions of aromatic hydrocarbon
		10. To correlate reagent and reactions
		11. Explain /Discuss important reactions of alkyl / aryl halides.
		12 To correlate reagent and reactions.
		13. Give synthesis of expected alkyl / aryl halides.
		14. Able to differentiate between alcohols and phenols.
		15. Explain / discuss synthesis of alcohols / phenols
		16. Write / discuss the mechanism of various reactions involved.



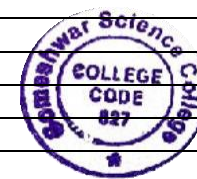
	CH-303: Practical Chemistry-III	1. Verify theoretical principles experimentally
		2. Interpret the experimental data on the basis of theoretical principles
		3. Correlate theory to experiments. Understand/verify theoretical principles by experiment observations; explain practical output / data with the help of theory
		4. Understand systematic methods of identification of substance by chemical methods.
		5. Write balanced equation for the chemical reactions performed in the laboratory.
		6. Perform organic and inorganic synthesis and is able to follow the progress of the chemical reaction by suitable method (colour change, ppt. formation, TLC).
		7. Set up the apparatus / prepare the solutions - properly for the designed experiments.
		8. Perform the quantitative chemical analysis of substances explain principles behind it.
		9. Systematic working skill in laboratory will be imparted in student.
SEMSER-IV	CH-401: Physical and Analytical Chemistry	1. Discuss meaning of phase, component and degree of freedom
		2. Derive of phase rule
		3. Explain of one component system with respect to: Description of the curve, Phase rule relationship and typical features for i) Water system ii) Carbon dioxide system iii) Sulphur system
		4. Define various terms, laws, differentiate ideal and non-ideal solutions.
		5. Discuss / explain thermodynamic aspects of Ideal solutions-Gibbs free energy change, Volume change, Enthalpy change and entropy change of mixing of Ideal solution
		6. Differentiate between ideal and non-ideal solutions and can apply Raoult's law.
		7. Explain / discuss conductometric titrations.
		8. Apply conductometric methods of analysis to real problem in analytical laboratory.
		9. Solve problems based on theory / equations
		10. Correlate different terms with each other and derive equations for their correlations.
		11. Discuss / explain / derive Beer's law of absorptivity..
		12 Explain construction and working of colorimeter
		13 Apply colorimetric methods of analysis to real problem in analytical laboratory
		14. Explain properties of adsorbents, ion exchange resins, etc.
		15. Discuss / explain separation of ionic substances using resins.
		16. Discuss / explain separation of substances using silica gel / alumina
	CH-402: Inorganic and Organic Chemistry	1. Apply principles of VBT to explain bonding in coordination compound of different geometries
		2. Correlate no of unpaired electrons and orbitals used for bonding.
		3. Identify / explain / discuss inner and outer orbital complex
		4. Explain / discuss limitation of VBT.
		5. Explain principle of CFT.
		6. Apply crystal field theory to different type of complexes (Td, Oh, Sq, Pl complexes)
		7. Identify and draw the structures aldehydes and ketones from their names or from structure name can be assigned.
		8. Explain / discuss synthesis of aldehydes and ketones.
		9. Write / discuss the mechanism reactions aldehydes and ketones.



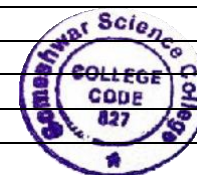


		10. Explain /Discuss important reactions of aldehydes and ketones.
		11. Explain / discuss synthesis of carboxylic acids and their derivatives
		12. Write / discuss the mechanism reactions carboxylic acids and their derivatives.
		13. Explain /Discuss important reactions of carboxylic acids and their derivatives.
		14. Correlate reagent and reactions of carboxylic acids and their derivatives
		15. To correlate reagent and reactions of carboxylic amines.
		16. Give synthesis diazonium salt from amines and reactions of diazonium salt.
		17. Perform inter conversion of functional group
		18. Draw the structures of different conformations of cyclohexane
		19. Define terms such as axial hydrogen, equatorial hydrogen, confirmation, substituted cyclohexane, etc
		20. Convert one conformation of cyclohexane to another conformation and should able to identify governing structural changes
	CH-403: Practical Chemistry-IV	1. Verify theoretical principles experimentally
		2. Interpret the experimental data on the basis of theoretical principles
		3. Correlate the theory to the experiments. Understand / verify theoretical principles by experiment or explain practical output with the help of theory.
		4. Understand systematic methods of identification of substance by chemical methods.
		5. Write balanced equation for all the chemical reactions performed in the laboratory.
		6. Perform organic and inorganic synthesis and able to follow the progress of the chemical reaction.
		7. Set up the apparatus properly for the designed experiments. 8. Perform the quantitative chemical analysis of substances and able to explain principles behind it.
T.Y. B.Sc. (2019 credit Pattern)		
T.Y. B.Sc. Semester V (2019 credit Pattern)	DSEC-I: CH-501: Physical Chemistry- I	1. Know historical of development of quantum mechanics in chemistry.
		2. Understand and explain the differences between classical and quantum mechanics.
		3. Understand the idea of wave function
		4. Dipole moment and its experimental determination by temperature variation method,
		5. Electromagnetic spectrum, Nature of wave and its characteristics such as wavelength, wave number, frequency and velocity, Energy level diagram
		6. Classification of molecules on the basis of moment of Inertia,
		7. Experimental method for the determination of quantum yields
		8. Photochemical reactions: photosynthesis, photolysis, photocatalysis, photosensitization
		9. Various photochemical phenomena like fluorescence and phosphorescence, Chemiluminescence,
		10. Problems
	DSEC-I: CH-502: Analytical Chemistry- I	1. Explain different principles involved in the gravimetry, spectrophotometry, parameters in instrumental analysis, qualitative analysis..
		2. Perform quantitative calculations depending upon equations student has studied in the theory. Furthermore, student should able to solve problems on the basis of theory.

		3. Discuss / Describe procedure for different types analyses included in the syllabus
		4. Differentiate / distinguish / Compare among the different analytical terms, process and analytical methods.
		5. Demonstrate theoretical principles with help of practical.
		6. Design analytical procedure for given sample.
		7. Select particular method of analysis if analyte sample is given to him
	DSEC-I: CH-503: Physical Chemistry Practical - I	CO1. Prepare different molar and normal concentrations of solution.
		CO2. Determine concentration of unknown solutions by colorimetric method.
		CO3. Measure the pH, pKa and Ka of various acids by pH- Metry and potentiometer.
		CO4. Measure refractive index and determine unknown concentration of various solvents.
		CO5. Determine the molecular weight of a given polymer by Viscometry.
		CO6. Investigate the reaction rate by physical and polarometric method
	DSEC-II: CH-504: Inorganic Chemistry - I	i. Explain electroneutrality principle and different types of pi bonding
		ii. Able to explain Nephelauxetic effect towards covalent bonding.
		iii. Explain MOT of Octahedral complexes with sigma bonding.
		iv. Able to explain Charge Transfer Spectra
		v. Able to compare the different approaches to bonding in Coordination compounds.
	DSEC-II: CH-505: Industrial Chemistry - I	1. Importance of chemical industry,
		2. Meaning of the terms involved,
		3. Concept of basic chemicals,
		4. Their uses and manufacturing process.
		5. Importance of sugar industry, ,
		6. Manufacture of direct
		7. Cane juice extraction by various methods
		8. Consumption (plantation white) sugar with flow diagram.
		9. Different types of soap products,.
		10. Chemistry of soap
		11. Raw materials required for soap manufacture
	DSEC-II: CH-506: Inorganic Chemistry Practical - I	CO1. Estimate the metal by gravimetric method..
		CO2. Carry out quantitative analysis by volumetric method and gravimetric methods.
		CO3. Carry out quantitative analysis by volumetric method.
		CO4. Prepare and determine percent purity of various inorganic complexes
		CO5. Understand and Perform paper chromatographic technique
		CO6. Estimate Titanium and Iron by colorimetric method
	DSEC-III: CH-507: Organic	1. Define and classify polynuclear and hetroonuclear aromatic hydrocarbons.



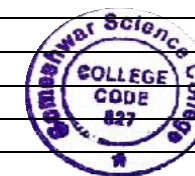
Chemistry - I	
	2. Write the structure, synthesis of polynuclear and hetroonuclear aromatic hydrocarbons.
	3. Understand the reactions and mechanisms
	4. To predict product with panning or supply the reagent/s for these reactions
	5. Hoffmann and Saytzeff's Orientation
	6. Effect of factors on the rate elimination reactions
DSEC-III: CH-508: Chemistry of Biomolecules	1.The student will understanding of Cell types, Difference between a bacterial cell, Plant cell and animal cell. Biological composition and organization of cell membrane, structure and function of various cell organelles of plant and animal cell
	2.The student will understand the types of carbohydrates and their biochemical significance in living organisms, structure of carbohydrates and reactions of carbohydrates with Glucose as example. Properties of carbohydrates.
	3.The student needs to know the types of lipids with examples, structure of lipids, properties of lipids
	4. The student will understand the structure and types of amino acids. Reactions of amino acids.
	5. The student know the classes of enzymes with subclasses and examples. Enzyme specificity, Equations of enzyme kinetics Km and its significance, features of various types of enzyme inhibitions, industrial applications of enzymes.
	6. Basic concepts of Endocrinology. Types of Endocrine glands and their hormones. Biochemical nature of hormones. Mechanism of action of lipophilic and hydrophilic hormones.
DSEC-III: CH-509: Organic Chemistry Practical-I	CO1. Understand and use Micro scale techniques for qualitative.
	CO2. Separate and analyze binary water soluble and insoluble mixture.
	CO3. Estimate - acetamide, glucose by volumetric method.
	CO4. Estimate basicity of various acids
	CO5. Prepare various organic compounds.
	CO6. Apply the crystallization technique for purification of compounds
	CO7. Understand Thin Layer Chromatographic techniques
SEC-III: CH-610: Skill Enhancing Course-III	Understood various components of soil and soil properties and their impact on plant growth.
	Understood the classification of the soil.
	Explores the problems and potentials of soil and decide the most appropriate treatment for land use.
	Understood the Reclamation and management of soil physical and chemical constraints.
	Useful in making decisions on nutrient dose, choice of fertilizers and method of application etc. practiced in crop production.
	Got experience on advanced analytical and instrumentation methods in the estimation of soil.
	Understood various Nutrient management concepts and Nutrient use efficiencies of major and micronutrients and enhancement techniques.
	Proper understanding of chemistry of pesticides will be inculcated among the students.
	Imparts knowledge on different pesticides, their nature and, mode of action and their fate in soil so as to monitor their effect on the environment.
CH-610 (B) Introduction to Forensic Chemistry	The forensic identification of illicit liquors.



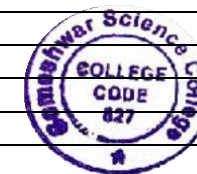
		The classification and characteristics of the narcotics, drugs and psychotropic substances.
		The menace of designer drugs.
		The methods of identifying of narcotics, drugs and psychotropic substance

**M.Sc. –I(Organic Chemistry)
(2019 credit Pattern)**

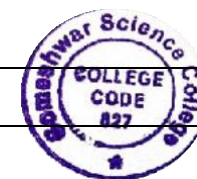
Semester - I	CHP-110, Physical Chemistry-I,	CO1. Apply mathematical tools to calculate thermodynamic and kinetic properties.
		CO2. Know relationship between microscopic properties of molecules with macroscopic thermodynamic observables.
		CO3. Formulate Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics.
		CO4. Generalize harmonic, anharmonic diatomic molecule and Born-Oppenheimer approximation.
		CO5. Understand molecular-level critical thinking skills.
		CO6. Understand the thermodynamic description of mixtures state function, exact, inexact differential. Understand the colligative properties of solutions
		CO7. Understand the statistical thermodynamics and various partition functions.
CHI-130, Inorganic Chemistry-I		1. Student should visualize/ imagine molecules in 3 dimensions.
		2. To understand the concept of symmetry and able to pass various symmetry elements through the molecule.
		3. Understand the concept and point group and apply it to molecules.
		4. To understand product of symmetry operations.
		5. To apply the concept of point group for determining optical activity and dipole moment
		6. Student should understand the importance of Orthogonality Theorem.
		7. They should able to learn the rules for constructing character table.
		8. Using reduction formulae should be able to find out the possible type of hybridization.
		9. Student should know the concept of SALC.
		10. Student able to find out character for reducible representation.
		11. To know about projection operator.
		12. Apply projection operator to find out the normalized wave function for atomic orbital.
		13. Student should correlate the application of symmetry to spectroscopy.
		14. Students able to find out the possible modes of vibration.
		15. From the previous knowledge of symmetry student must able to find out which mode are IR active.
CHO-150, Organic Chemistry-I		1. To understand some fundamental aspects of organic chemistry, to learn the concept aromaticity, to understand the various types of aromaticity
		2. To study heterocyclic compound containing one and two hetero atoms with their structure, synthesis and reactions.
		3 To know stereochemistry of organic compounds; able to do interconversion of Fischer to Newmann, Newmann to Sawhorse and vice versa, Able to assign R and S to given molecules; understand stereoselective and stereospecific reactions; acquire knowledge on topicity..
		3. To study structure, formation, stability and related name reaction of intermediates like Carbocation, Carbanion, Free Radical, Carbenes and nitrenes; Recognize neighboring group participation
		5. To study rearrangement reaction with specific mechanism and migratory aptitude of different groups.
		6 To study Ylides and their reaction.
		7. To understands the basis of redox reaction; acquire knowledge about the reagents which causes selective oxidation / reduction in various compounds; learn the basic mechanism of oxidation / reduction in organic compounds.
CHG – 190, General Chemistry-I		1) Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
		2) Students will be able to function as a member of an interdisciplinary problem solving team.



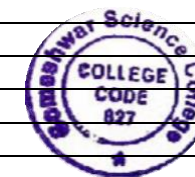
		3) To impart the students thorough idea in the chemistry of carbohydrates, amino acids, proteins and nucleic acids etc.
		4) Be able to describe the chemical basis for replication, transcription, translation and how each of these central processes can be expanded to include new chemical matter.
		5) Develop skills to critically read the literature and effectively communicate research in a peer setting.
	General Chemistry-I Section I	1. Students are trained to different purification techniques in organic chemistry like recrystallization, distillation, steam distillation and extraction
	Basic Chemistry-I Section II	2. Students are made aware of safety techniques and handling of chemicals.
		3. Students are made aware of carrying out different types of reactions and their workup methods.
		4. This practical course is designed to make student aware of green chemistry and role of green chemistry in pollution reduction.
Semester II	CHP-210 Physical Chemistry - II	CO1. Indicate the properties of an atomic nucleus that make it unstable and undergo nuclear decay.
		CO2. Explain the methods to detect various types of ionizing radiation.
		CO3. Discuss the methods behind nuclear instrumentation for detection of ionizing radiation.
		CO4. Understand the use of radiotracer technique in the laboratory.
		CO5. Students learn about the Indians nuclear energy programme.
		CO6 Explain spectra and relate the observations to electronic, molecular and dynamic processes occurring in the samples.
		CO7. Able to account for spectroscopic methods in different energy intervals.
		CO8. Interpret the basic processes associated with molecular phenomena.
		CO9. Use optical spectroscopy to study the structure and orientation of molecules adsorbed on surfaces.
		CO10. Justify the difference in intensity between Stokes and anti-Stokes lines.
		CO11. Explain the concept of crystallography and apply it to different crystal structures.
		CO12. Understand the molecular spectroscopy: I.R, Raman, electronic and Mossbauer and its application
	CHI-230, Inorganic Chemistry	1. find out the no of microstates and meaningful term symbols, construction of microstate table for various
		2. Hund's rules for arranging the terms according to energy.
		3. Student should understand inter electronic repulsion.
		4. Student should know the concept of weak and strong ligand field.
		5. Student able to find out splitting of the free ion terms in weak ligand field and strong ligand field.
		6. To draw correlations diagram for various configurations in Td and Oh ligand field.
		7. Student should know basic instrumentation and selection rules and relaxation in rules.
		8. Student should know basic d-d transition, d-p mixing, charge transfer spectra. configuration
		9. Interpretation of electronic spectra for spin allowed oh and td complexes using Orgel diagram.
		10. Understand the concept of spectro chemical series and Nephelauxetic series.
		11. Should able to solve numerical based on crystal field parameters.
		12. Understand the various terms involved in magnetochemistry.
		13. Various phenomenons of magnetism and their temperature dependence.
		14. Various experimental methods to find out magnetic moment.
		15. Understand the various Quenching of orbital angular momentum
	CHO – 250, Organic Chemistry-II,	1. MOT and will be able to extend this in predicting reaction mechanism and stereochemistry of electrocyclic reactions.
		2. The concepts in free radical reactions, mechanism and the stereo chemical outcomes.



		3. The basic principle of spectroscopic methods and their applications in structure elucidation of organic compounds using given spectroscopic data or spectra.
	CHG – 290, General Chemistry -II	1. Different characterization technique of solids
		2. Principle of XRD, instrumentation of powder XRD, Brags law, applications of XRD for crystal structure determination, numerical problems.
		3. Principle of SEM, instrumentation of SEM and interpretation of surface morphology of solid from SEM.
		4. Principle of TEM, instrumentation of TEM and interpretation of TEM images.
		5. Basics of X-rays, Principle of XRF, types of XRF, instrumentation, qualitative and quantitative analysis, numerical.
	CHP-227: Practical Course-II	1. Students are trained to different purification techniques in organic chemistry like recrystallization, distillation, steam distillation and extraction.
	Basic Practical Chemistry	2. Students are made aware of safety techniques and handling of chemicals.
		3. Students are made aware of carrying out different types of reactions and their workup methods.
		4. This practical course is designed to make student aware of green chemistry and role of green chemistry in pollution reduction.
M.Sc. –II(Organic Chemistry) (2019 credit Pattern)		
M.Sc. -II	CHO-350: Organic Reaction Mechanism and Biogenesis	Understand the concept of aliphatic nucleophilic and electrophilic reactions
(Organic Chemistry)		• Realize about the different types of nucleophilic substitution reactions in aliphatic compounds.
Semester III		• Know about the different positions of nucleophilic substitution reactions in different class of compounds.
		• Realize about the different types of electrophilic substitution reactions and their mechanisms in aliphatic compounds
		• Understand about the free radical chemistry, • Know about the generation of free radicals.
		• Know about the photochemical reactions of various classes of compounds like olefins, carbonyl compounds, aromatic compounds.
		• Know about the various photochemical oxidation and reduction reactions.
		• Understand the concept of pericyclic reactions like electrocyclic, cycloaddition and sigmatropic reactions on the basis of MO pictures and different approaches.
		• Understand the concept of biochemical reactions and mechanisms involved in living systems.
		• Know about the different types of free radical mechanisms in different class of compounds.
		• Know about the various name reactions which are involved with free radicals.
		• Understand the concept of organic photochemistry with different processes and terminologies
		• Know about the various reactions involved with different biomolecules in the living systems.
	CHO-351: Structure Determination of Organic Compounds by Spectroscopic Methods	The student will be able to have achieved advanced knowledge about the interactions of electromagnetic radiation and matter and their applications in spectroscopy.
		• Able to apply formalisms based on molecular symmetry to predict spectroscopic properties.
		• Able to analyse and interpret spectroscopic data collected by the methods discussed in the course.
		• Able to solve problems related to the structure determination, and to study molecular interactions by choosing suitable spectroscopic methods and interpreting corresponding data.
	CHO-353(A): Protection - De-protection, Chiron approach and	CO I Students become aware of Protection and de-protection of functional group in organic synthesis, chiron approach, basics of carbohydrates, synthesis of glycosides, synthesis of disaccharides, trisaccharides & polysaccharides.

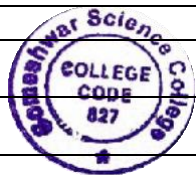


	Carbohydrate Chemistry	
	CHO-354: Practical-I Solvent Free Organic Synthesis	CO1 Students will be able to perform practical like Solvent Free Carbon–Carbon Bond Formation, C– N Bond Formation, C–S Bond Formation, C–X Bond Formation, N–N Bond Formation, Other Solvent-Free Reactions, supramolecular assembly formation
	CHO-450: Chemistry of Natural Products	CO1 Learn the different types of alkaloids, glycosides & terpenes etc and their chemistry and medicinal importance.
		CO2 Explain the importance of natural compounds as lead molecules for new drug discovery.
		CO3 Learn the constituent present in crude drugs responsible for anti-diabetic activity
		CO4 Discuss rDNA technology tool for new drug discovery.
		CO5 Explain vitamins Chemistry and Physiological significance of Vitamin
		CO6 Elaborate general methods of structural elucidation of compounds of natural origin.
		CO7 Learn advanced methods of structural elucidation of compounds of natural origin.
		CO8 Understand isolation, purification and characterization of simple chemical constituents from the natural source
	CHO-452(A): Concepts and Applications of Medicinal Chemistry	CO1: Definition, Classification of the drugs with examples and structures
		CO2: Explain the Drugs used for various infectious diseases caused by pathogens
		CO3: Describe the structure activity relation of some important class of drugs
		CO4: Explain mechanism of action of the drugs
		CO5: Describe synthesis of medicinally important drug
		CO6: Explain Therapeutic uses of drugs and Specific side effect of ‘Drug Substances’
		CO7: Explain physico chemical properties related to QSAR
		CO8: Describe various approaches and designing of drug molecules including pro drug and Combinatorial chemistry
	CHO-453 Practical Section-I: Ternary Mixture Separation	CO1 Understand and employ concept of type determination and separation
	Section-I: Carbohydrates Synthesis and Isolation of Natural Products	CO2 Perform qualitative estimation of functional groups
		CO3 Recrystallize /distill the separated compounds.
		CO4 Carbohydrate Synthesis.
		CO5 Isolation of pigments from the natural products.
		CO6 Isolation of essential oils from the natural products.
		CO7 Isolation of medicinally important component from the natural products
		CO8 Students should carry out a small research project.
		CO9 Becomes familiar with i. Literature survey, research methodologies, Column and TLC chromatographic techniques
	CHO454: Practical II Convergent and Divergent Organic Syntheses	CO1 Learn convergent Synthesis involving acylation, reduction.
		CO2 Divergent Synthesis involving acylation, nitration, One pot synthesis,
		CO3 Resolution technique
		CO4 Sulfonation reaction
		CO5 Three Stage Syntheses.
Department of Zoology		
F.Y. B.Sc.		

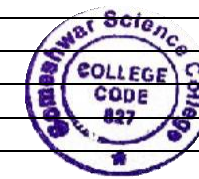


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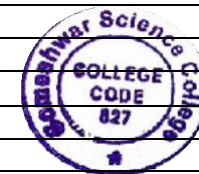
Semester I	ZO-111) Animal Diversity –I	CO 1 The student will be able to understand classify and identify the diversity of animals.. CO 2 The student understands the importance of classification of animals and classifies them effectively using the six levels of classification. CO 3 The student knows his role in nature as a protector, preserver and promoter of life which he has achieved by learning, observing and understanding life.
	ZO 112 Animal Ecology	CO 1 The learners will be able to identify and critically evaluate their own beliefs, values and actions in relation to professional and societal standards of ethics and its impact on ecosystem and biosphere due to the dynamics in population. CO 2 To understand anticipate, analyse and evaluate natural resource issues and act on a lifestyle that conserves nature. CO 3 The Learner understands and appreciates the diversity of ecosystems and applies beyond the syllabi to understand the local lifestyle and problems of the community. CO 4 The learner will be able to link the intricacies of food chains, food webs and link it with human life for its betterment and for non-exploitation of the biotic and abiotic components. CO 5 The working in nature to save environment will help development of leadership skills to promote betterment of environment.
	ZO113 Zoology Practical Paper	CO 1 The student understands the importance of classification of animals and classifies them effectively using the six levels of classification. CO 2 The student knows his role in nature as a protector, preserver and promoter of life which he has achieved by learning, observing and understanding life. CO 3 The learner will be able to link the intricacies of food chains, food webs and link it with human life for its betterment and for non-exploitation of the biotic and abiotic components.
	ZO-121 Animal Diversity –II	CO 1 The student will be able to understand classify and identify the diversity of animals.. CO 2 The student understands the importance of classification of animals and classifies them effectively using the six levels of classification. CO 3 The student knows his role in nature as a protector, preserver and promoter of life which he has achieved by learning, observing and understanding life.
	ZO122 Cell biology	CO 1 The learner will understand the importance of cell as a structural and functional unit of life. CO 2 The learner understands and compares between the prokaryotic and eukaryotic system and extrapolates the life to the aspect of development. CO 3 The dynamism of bio membranes indicates the dynamism of life. Its working mechanism and precision are responsible for our performance in life. CO4. The cellular mechanisms and its functioning depends on endo-membranes and structures. They are best studied with microscopy.
	ZO123 Animal Diversity –II	CO1. The student understands the importance of classification of animals and classifies them effectively using the six levels of classification CO2. The dynamism of bio membranes indicates the dynamism of life. Its working mechanism and precision are responsible for our performance in life. CO3. The student knows his role in nature as a protector, preserver and promoter of life which he has achieved by learning, observing and understanding life.



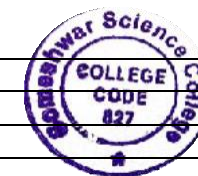
Semester-III	ZO – 231 Animal Diversity - III	CO 1 The students will be able to understand, classify and identify the diversity of higher vertebrates.
		CO 2. The students will able to understand the complexity of higher vertebrates
		CO 3 The students will be able to understand different life functions of higher vertebrates.
		CO 4 The students will be able to understand the linkage among different groups of higher vertebrates.
		co 5 The student will become aware regarding his role and responsibility towards nature as a protector, to understand his role as a trustee and conservator of life which he has achieved by learning, observing and understanding life.
	ZY- 212 Applied Zoology	CO 1. Study of different types of fisheries and ponds.
	(Fisheries & Agricultural Pests	CO 2. Study of culture of freshwater fishes like Rohu, Catla, Mrigal and Prawn.
	and their Control) Paper II	CO 3. Study of harvesting methods of some marine forms like Harpedon, Mackeral, lobster, Pearl oyster.
		CO 4. Study of fishery byproducts and different fish preservation techniques.
		CO 5. Study the Introduction to Pests and Various types of Pests.
		CO 6. Study the Insect pests of Agricultural Importance. (Marks of Identification, Life cycle, Nature of damage, and Control measures.)
		CO 7. Study of Non-insect Pests.
		CO 8. Study of the pest control practices in brief.
		CO 9. Study of the plant protection appliances.
		CO 10. Study of pesticides.
Semester-IV		
	(ZY 221) Animal Systematics and	CO 1. Study of invertebrate phyla like Arthropoda, Mollusca & Echinodermata
	Diversity V (Paper-I)	CO 2. Study of Arthropoda, Mollusca Echinodermata with reference to there specific characteristics like mimicry, larval forms, shell and foot modification and pedicillariae.
		CO 3. Detailed study of morphology and physiology of various system of <i>Asterius</i> .
	(ZY 222) Applied Zoology II	CO 1 Study the concept of Apiculture and nesting behavior of <i>A. dorsata</i> , <i>A. florae</i> , <i>A. indica</i> and <i>A. mellifera</i> .
	(Apiculture & Sericulture)	CO 2. Study of bee keeping equipment.
		CO 3. Study of bee keeping and seasonal management.
		CO 4. Study of different types of bee products.
		CO 5. Study of bee diseases and enemies.
		CO 6. Study the concept of Sericulture and different types of silkworm like Mulberry, Tassar, Eri and Muga silkworms in India.
		CO 7. Study of morphology and life cycle of <i>Bombyxmori</i> .
		CO 8. Study of cultivation and harvesting of mulberry plant.
		CO 9. Study of silkworm rearing and postharvest processing
Department of Microbiology		
F.Y. B.Sc.		
(2019 credit Pattern)		
Semester I	MB 111 Introduction to Microbial World	CO 1. The course aids in basic understanding of the genesis of Microbiology with
		CO 2. The scope of Microbiology in the different fields with thrust on the applications of microorganisms of ancient and advanced periods.
		CO 3. The characterization of various groups of microorganisms based on morphology and reproduction using Bergey manual for bacteria and viruses by ICTV.



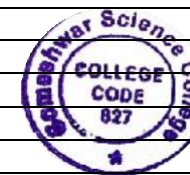
	MB 112 Basic Techniques in Microbiology	CO 1. Awareness of bio safety, containment, asepsis and their role in microbiology laboratories.
		CO 2. Knowledge of the measurements used in microbiology in terms of micrometry, units, conversions.
		CO 3. Understanding the principles of basic microscopy, use of different types of microscopes, care & maintenance in handling microscopes.
		CO 4. Knowledge of the stains used in study of microorganisms, staining methods, role of different stains and theories of staining.
	MB113 Practical Course based on theory papers MB 111 and MB112	CO 1. Learning of the general instructions of safety in microbiology, discuss the need of micro-aid box.
		CO 2. Skills for handling instruments of microbiology laboratory with care & maintenance, creation of SOPs.
		CO 3. Skills for handling different types of microscopes and learn the design, functioning and maintenance.
		CO 4. Collection of samples for identification of the microorganisms from natural habitats and characterize morphologically, staining & motility.
		CO 5. Enumeration of the bacteria, fungal cells & their spores by Neubauer chamber method.
		CO 6. Knowledge of aseptic transfer techniques.
Semester II	MB121 Bacterial Cell and Biochemistry	CO 1. Detailing the the cytology of microorganisms with respect to ultra structure to be used in identification.
		CO 2. Analysis of the role of biological chemicals in cell by understanding the types, functions with examples.
	MB122 Microbial cultivation and growth	CO 1. Learning of the methods of sterilization, disinfection, mechanisms of each agent, testing the disinfectant. efficiency
		CO 2. Assessment of the requirements of growth, nutrients, media ingredients, media preparation, enrichment methods, pure culture isolation methods, identification & special cultivation methods for each group of microorganisms.
		CO 3. Study of the principles of general growth, compare the different types of growth, measurement methods with emphasis on industry.
	MB123 Practical Course based on theory papers MB121 and MB122	CO 1. Preparation of media for cultivation of microorganisms and perform media sterilization and checking its efficiency, to study the growth characters on different media.
		CO 2. Learning of the pure culture isolation methods by streak, spread, pour plate method after serial dilution of the given soil sample.
		CO 3. Enrichment of the soil microorganisms using winogradskys column, enrichment media.
		CO 4. Demonstration of the methods of disinfection and check the effect of disinfectants on skin microflora.
		CO 5. Learning of the method of phenol co-efficient method.
		CO 6. Assessment of the optimization of the growth conditions and to test the effect of each factor at different limits.
S.Y. B.Sc. (2019 credit Pattern)		
Semester-III	MB 231 Medical Microbiology and Immunology	CO 1. Study the anatomy, physiology of various human systems like respiratory, gastrointestinal tract, kidney, liver, nervous system, genital system
		CO 2. Understanding the principles of epidemiology used in study of infectious diseases with respect to pathogen transmission, modes of spread and control. The various models of epidemiological studies.
		CO 3. Learning the characterization of pathogens based on morphology, cultural, antigenic characters, pathogen city, virulence, disease diagnosis, prophylaxis, chemotherapy and prevention.

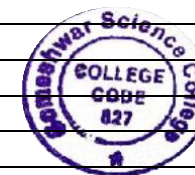


	MB 232 Bacterial Physiology and Fermentation	CO 1. Study the principles of bacterial taxonomy, classification, identification based on Bergeys manual.
		CO 2. Learning of the different methods used in taxonomy.
		CO 3. Sketching of the different physiology in different cells with the pathways and the role of enzymes as catalysts with the principles of their action.
	MB 233 Practical Course based on theory papers MB 231 and MB 232	CO 1. Learning of the air sampling methods by settling velocity and Simpsons diversity index and to comment on the air quality
		CO 2. Identification and characterization of pathogens form air, soil and water by cultural, morphological and biochemical characterization
		CO 3. Knowledge of the water sampling methods, potability testing, D.O., BOD, TS, TSS, TDS determination.
Semester-IV	MB 241 Bacterial Genetics	CO 1. Study of the methods of gene transfer in prokaryotes and eukaryotes like transformation, transduction and conjugation.
		CO 2. Study of the gene repair mechanisms.
		CO 3. Understanding of the recombination in bacteriophages
		CO 4. Learning of the types of plasmids, construction, properties, role in gene transfer with examples.
	MB 242 Air, Water and Soil Microbiology	CO 1. Learning of the air sampling methods by settling velocity and Simpsons diversity index and to comment on the air quality
		CO 2. Identification and characterization of pathogens form air, soil and water by cultural, morphological and biochemical characterization
		CO 3. Knowledge of the water sampling methods, potability testing, D.O., BOD, TS, TSS, TDS determination.
	MB 243 Practical Course based on theory papers MB241 and MB 242	CO 1. Study of the methods of gene transfer in prokaryotes and eukaryotes like transformation, transduction and conjugation.
		CO 2. Study of the gene repair mechanisms.
		CO 3. Learning of the air sampling methods by settling velocity and Simpsons diversity index and to comment on the air quality
		CO 4. Identification and characterization of pathogens form air, soil and water by cultural, morphological and biochemical characterization
T.Y. B.Sc. (2019 credit Pattern)		
Semester-V	MB 351 Medical Microbiology- I	CO 1. Study of the principles of chemotherapy, action of antimicrobials – antibiotics, antivirals, antiprotozoals, antifungals and antimetabolites
		CO 2. Knowledge of the mechanism involved in drug resistance and how to avoid & combat drug resistance.
		CO 3. Learning of the viral pathogens with respect to structure, disease, symptoms, transmission, pathogenecity, virulence, diagnosis, treatment and prevention.
		CO 4. Study of parasitic infections with respect to the disease characters.
		CO 5. Understanding of the fungal pathogens and the diseases caused in humans.
		CO 1. Understanding of the screening methods used in fermentation industry, strains used & their characters.
	MB 352 Immunology- I	CO 1. Understanding of the types of immunity, immune system, components of immune system, cells & organs involved in immunity.
		CO 2. Study of the antigens properties, types, role of adjuvants, haptens,
		CO 3. Study of the types of antibodies, structure of antibody, formation of antibodies.

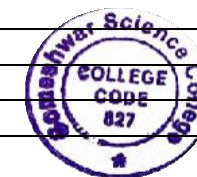


		CO 4. Understanding of the mechanisms involved in Cell mediated and humoral immunity.
		CO 5. Understanding of the concept of transplantation immunology.
	MB 353 Enzymology	CO 1. Understanding of the methods involved in characterization of active site of the enzymes, amino acids involved in catalysis.
		CO 2. Study of the types, role, reactions of co-enzymes.
		CO 3. Learning of the kinetics of enzyme reactions, with various models.
		CO 4. Understanding of the regulations of enzymes, mechanisms with examples.
		CO 5. Study of the methods of enzyme purification.
		CO 6. Knowledge of the methods of assay of enzymes.
		CO 7. Learning of the methods of enzyme immobilization.
	MB 354 Genetics	CO 1. Learning of the methods of gene linkage and crossing over.
		CO 2. Study of the methods of gene replication with focus on steps, proteins, enzymes involved in prokaryotes and eukaryotes.
		CO 3. Understanding of the process of gene transcription with comparison of prokaryotes and eukaryotes
		CO 4. Understanding of the process of gene translation with comparison of prokaryotes and eukaryotes.
	MB 355 Fermentation technology- I	CO 1. Study of the methods of strain improvement, isolation methods of mutants, use of improved strains in industry with examples.
		CO 2. Ability to work out the methods of media optimization like classical approach, plackett Burmann method response surface method with solving problems
		CO 3. Understanding of the methods of sterilization of media in industries with focus on sterilization kinetics.
		CO 4. Learning of the objectives of Scale up and scale down in fermentations and the criteria for scale up.
		CO 5. Qualitative and quantitative assessment of the fermentation products by USP, IP guidelines.
		CO 6. Study of the principles of fermentation economics.
		CO 7. Learning of - how to patent, patent laws, process and rights and claims along with IPR.
		CO 8. Formulation of GMP, SOP for fermentation industry.
	MB 356 Agricultural Microbiology	CO 1. Learning of the management of plant diseases by physical, chemical, biological methods.
		CO 2. Usage of antisense RNA technology, BT technology in plant crop improvement.
		CO 3. Understanding of the concept of integrated pest management,
		CO 4. Learning of the role of microorganisms in environment with focus on potassium mobilization, phosphate solubilization, free living nitrogen fixation, symbiotic nitrogen fixation, biochemistry, genes involved, role of enzymes, bioterrorism, nanobiotechnology, bioremediation, mineral leaching, biodegradation of xenobiotics.
	MB 357 Practical Course I	CO 1. Learning of the air sampling methods by settling velocity and Simpsons diversity index and to comment on the air quality
		CO 2. Identification and characterization of pathogens from air, soil and water by cultural, morphological and biochemical characterization.
		CO 3. Knowledge of the water sampling methods, potability testing, D.O., BOD, TS, TSS, TDS determination.
	MB 358 Practical Course II	CO 1. Quantification of sugar, total protein, albumin, cholesterol, bilirubin, urea from clinical samples.
		CO 2. Quantitative identification of the various types of amino acids, sugars by suitable spot tests.
		CO 3. Estimation of the total sugars, total proteins, reducing sugars by suitable colorimetric methods.
	MB 359 Practical Course III	CO 1. Estimation of the total RBC, WBC, PCV, ESR, haemoglobin content of the given blood samples.
		CO 2. Determination of the blood group by hemagglutination.
		CO 3. Skills to perform gel immuno diffusion technique.



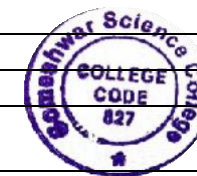


	MB 3510 Marine Microbiology	CO 1 To impart the awareness of unseen and unexplored niche of marine ecosystem of microbes.
		CO 2 To acquire advances in the knowledge of marine microbes and marine ecology.
		CO 3 To learn the field research on marine processes and laboratory research on microorganisms.
		CO 4 To comprehend the role of marine microbes in bioremediation and bioprospecting.
		CO 5 To avail career opportunities in marine education, industry and research.
	MB 3511 Dairy Microbiology	CO 1 To understand prospects of dairying at commercial marketing..
		CO 2 To acquire skills of processing of milk and dairy products.
		CO 3 To assess quality control in dairy industry.
		CO 4 To comprehend production of dairy products of commercial significance with emphasis to local and global market demand
Semester-VI	MB 361: Medical Microbiology II	CO 1 Understand the human anatomy, pathogens associated with diseases.
		CO 2 Acquire knowledge of principles underlying establishment of pathogens in human body
		CO 3 Comprehend of pathogenesis of specific pathogens causing microbial diseases.
		CO 4 Assess epidemiological patterns of microbial disease transmission as various modes, intensity at local and global level.
		CO 5 Gain Knowledge principles of chemotherapy of microbial diseases and development of drug resistance among pathogens and strategies to mitigate.
		CO 6 Develop identification systems for microbial disease diagnosis, disease treatment and prevention measures
	MB 362 Immunology– II	CO 1 Understand immune system structure, composition, function and comparison of different types of immunity.
		CO 2 Acquire knowledge about antigens, Recognition of pathogens; antigen processing and presentation; Immunity to infection and pathological consequences of Immune deficiencies.
		CO 3 To learn the applications of Immunology in monoclonal antibodies, vaccines production and Immunotherapy
		CO 4 Understand abnormal working of Immune system in hypersensitivity, auto immune diseases, immune tolerance and transplantation immunology
		CO 5 To develop strategies for Diagnosis of diseases based on antigen and antibody reactions with emphasis on prevailing communicable diseases.
	MB 363: Metabolism	CO 1 To understand methods of active site determination, role of enzymes and its cofactors in microbial physiology.
		CO 2 To learn to perform enzyme assay, purification and quantification of enzymes activity, enzyme kinetics in terms of initial, final velocity, mathematical expression of enzyme kinetic parameters.
		CO 3 To correlate regulation of metabolism at enzymatic levels and apply, methodology for commercial applications of enzymes
		CO 4 To learn mechanisms of transport of solutes across the membrane
		CO 5 To get acquainted with mechanism of biosynthesis and degradation of biomolecules
		CO 6 To comprehend basic concept of autotrophic mode of metabolism of prokaryotes
	-MB-364: Molecular Biology	CO 1 To exhibit a knowledge base in Genetics and Molecular Biology
		CO 2 To understand the central dogma of Molecular Biology



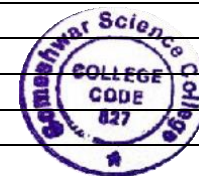
	CO 3 To construct genetic map of bacteria and fungi
	CO 4 To get introduced to concept of recombination and bacteriophage Genetics
	CO 5 To understand the concept cloning in bacteria
	CO 6 To demonstrate the knowledge of common and advanced laboratory practices in Molecular Biology
MB 365 Fermentation Technology – II	CO 1 To impart technical understanding of commercial fermentations.
	CO 2 To apply classical, advanced strain improvement and isolation techniques for fermentation processes.
	CO 3 To optimize and sterilize media used in fermentation industry for Commercially economical and efficient fermentations.
	CO 4 To recover the product using suitable methods and ensuring quality of the finished product by quality assurance tests.
	CO 5 To acquaint fermentation economics, process patentability, process validation.
	CO 6 To comprehend the large scale productions of commercially significant fermentation Products of classical and recent significance.
MB 366: Food Microbiology	CO 1 To describe food safety problems and solutions in India and global scale.
	CO 2 Identify and classify types of microorganisms in food processing and compare their Characteristics and behavior
	CO 3 To learn food classification based on their perishability, intrinsic and extrinsic factors affecting the growth of microbes in foods, role of microorganisms in food fermentation
	CO 4 To acquire knowledge about food spoilage, food borne diseases, predisposition and preventive and control measures
	CO 5 To apply principles of sanitation, heat treatment, irradiation, modified atmosphere ,antimicrobial preservatives and combination of method (hurdle concept) to control microbial growth with emphasis on HACCP guidelines.
MB 367: Diagnostic Microbiology and Immunology	CO 1. Understanding of the types of immunity, immune system, components of immune system, cells & organs involved in immunity.
	CO 2. Study of the antigens properties, types, role of adjuvants, haptens,
	CO 3. Study of the types of antibodies, structure of antibody, formation of antibodies.
	CO 4. Understanding of the mechanisms involved in Cell mediated and humoral immunity.
	CO 5. Understanding of the concept of transplantation immunology.
MB 368: Metabolism and Molecular Biology	CO 1. Learning of the mechanisms of membrane transport in cells with the ports, proteins and significance.
	CO 2. Understanding of the principles of thermodynamics with respect to free energy, entropy, enthalpy, laws , high energy compounds- structure, reactions, role in cells, oxidative phoshphorylation, ETC, uncouplers of ETC.
	CO 3. Study of the mechanisms of photosynthesis in plants and microbes.
	CO 4. Study of the biosynthesis & degradation of starch, lipids, proteins and nucleic acids.
MB 369 Fermentation Technology- II and Food Microbiology	CO 1. Study of the methods of strain improvement, isolation methods of mutants, use of improved strains in industry with examples.
	CO 2. Ability to work out the methods of media optimization like classical approach, plackett Burmann method response surface method with solving problems
	CO 3. Understanding of the methods of sterilization of media in industries with focus on sterilization kinetics.
	CO 4. Learning of the objectives of Scale up and scale down in fermentations and the criteria for scale up.

		CO 5. Qualitative and quantitative assessment of the fermentation products by USP, IP guidelines.
		CO 6. Study of the principles of fermentation economics.
		CO 7. Learning of - how to patent, patent laws, process and rights and claims along with IPR.
		CO 8. Formulation of GMP, SOP for fermentation industry.
	MB 3610 Waste Management	CO 1 To understand waste management and its practicable applicability.
		CO 2 To assess the magnitude and influence of hazardous content of waste, pollution of waters and waste water treatment technologies.
		CO 3 To learn the design and working of treatment plants and methods used for liquid and solid waste treatment
		CO 4 To impart the understanding of kinetics of biological systems used in waste treatment.
		CO 5 To learn the standards of waste management and competent authorities involved at National and international level.
	MB 3611 Nano-biotechnology	CO 1 To understand design, development and application of Nano materials and their application in Nano devices.
		CO 2 To learn fundamentals of nanotechnology as to Synthesis and characterization techniques of nanoparticles
		CO 3 To acquire knowledge of applications of nano materials in different disciplines of human life.
		CO 4 To compare the merits of using nanotechnology with existing technologies.
Department of Botany		
F.Y. B.Sc.		
(2019 credit Pattern)		
Semester I	BO-111: Plant life and utilization I	CO1. Emphasis on understanding of different plant groups.
		CO2. Inculcation of the awareness about biodiversity.
		CO3. Understanding of economic implications of Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.
	BO-112: Plant morphology and anatomy	CO1. Understanding of economic implications of Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms
		CO2. Provision of phylogenetic i.e. evolutionary line among the plants.
		CO3. Identification of technique for research.
	BO 113: Practicals based on BO 111 & BO 112	CO1. Development of techniques in identification, classification of plants of different groups.
		CO2. Understanding of morphological features of root, stem, leaves, flower, fruits and seeds.
		CO3. Enumerating the internal primary structure of dicotyledonous root, stem and leaf.
		CO4. Study of internal primary structures of monocot and dicots w.r.t. root, stem and leaf.
		CO5. Understanding the life cycle pattern of Study of Spirogyra, Cystopus, Riccia, Nephrolepis and Cycas.
		CO6. Demonstrating the uses of plant resources in industries: food, fodder, fibre, medicine, timber and Gum.
		CO7. Study of artificial plant propagation methods: Stem cutting, Air Layering, Approach grafting, and T- budding.
Semester II	BO-121: Plant life and utilization-II	CO1. Study of Morphology Introduction, Definition and Scope. Descriptive and Interpretative. Importance in identification, nomenclature, classification, phylogeny and Plant breeding.
		CO2. Understanding of Morphology of Vegetative Parts such as root, stem and leaves
		CO3. Study of Morphology of Reproductive Parts such as inflorescence, flower, fruit and seeds.



		CO4. Understanding of internal organisation of plants, ecological interpretations, pharmacognosy and wood identification.
		CO5. Knowledge of taxonomic base on the basis of anatomical features.
	BO-122: Principles of plant science	CO1. Introduction to industrial applications of Botany.
		CO2. The course provides basic foundation for self employment generation through floriculture techniques, Bio fertilizes, nursery techniques, organic fertilisers, etc.
		CO3. Study of Plant Nursery Industry Concept and types of nurseries: ornamental plant nursery, fruit plant
		CO4. Nursery, medicinal plant nursery, vegetable plant nursery, orchid nursery, forest nursery
		CO5. Understanding of the general techniques Plant Tissue Culture Industry Concept of tissue culture.
		CO6. Understanding of the Agri industries Organic Farming: Concept, need of organic farming, types of organic fertilizers, advantages and limitations for sustainable agriculture and healthy life.
	BO 123: Practicals based on BO 121 & BO 122	CO1. Study of the various plant tissue culture techniques: Demonstration of various stages.
		CO2. Demonstration of the methods of Cultivation of Oyster mushroom and demonstration of value added mushroom products.
		CO3. Study of plant resources used in bio-pesticides such as Indiar, Azadiractin.
		CO4. Assessing the industrially important fungi and their products.
		CO5. Study of types of Biofertilizers: Rhizobium, Azatobacter, BGA, Azolla.
		CO6. Performing the recipe of Jam and Squash preparation.
S.Y. B.Sc. (2019 credit Pattern)		
Semester III	BO 231: Taxonomy of Angiosperms and Plant Ecology	CO1. Knowledge regarding Angiosperm Taxonomy.
		CO2. Understanding of Systems of classification with their merits and limitations- a) Artificial system- Carl Linnaeus, b) Natural system -Bentham and Hooker, c) Phylogenetic system- Engler and Prantl
		CO3. Awareness of Taxonomic literatures w.r.t. Flora, monograph, revisions, manuals, journals, periodicals and references books.
		CO4. Study of Sources of data for Systematics such as Morphology, Anatomy, Cytology, Embryology And Phytochemistry
		CO5. Study of Botanical Nomenclature
		CO6. Study of Plant Families with reference to systematic position, salient features, formula, floral diagram and any five examples with their economic importance – Annonaceae.
		CO7. Meliaceae, Myrtaceae, Rubiaceae, Solanaceae, Asclepiadaceae, Euphorbiaceae
		CO9. Study of Computer in taxonomy
		CO10. Introduction to ecology includes Definition, Concept, Autecology and Synecology.
		CO11. Knowledge of Ecosystem and its components: biotic and abiotic, Food chain, Food web, Ecological pyramids.
	BO 232: Plant Physiology	CO1. Introduction of Plant Physiology.
		CO2. Understanding of the Scope and applications of plant physiology.
		CO3. Learning of the Physico-chemical properties of water.
		CO4. Study of the phenomenon like Diffusion, Osmosis, Plasmolysis, Imbibition.
		CO5. Understanding of Mechanisms of water absorption.

		CO6.Study of the Physical force theories of Ascent of sap.
		CO7. Learning of the Mechanism of opening and closing of stomata.
		CO8. Study of processes like Guttation and Exudation and their significance in plant metabolism.
		CO9. Study of Factors affecting growth.
		CO10.Knowledge of Properties and to understand practical applications of auxins, cytokinins, gibberellins, ethylene and abscisic acid.
		CO11. Learning of types of seed dormancy Methods to break seed dormancy.
		CO12. Study of physiology of flowering with respect to Photoperiodism, Phytohormones, and Vernalisation.
	Semester III: Practical based on BO 231 & BO 232	CO1. Development of various techniques in the field of Taxonomy, Anatomy, Physiology, Embryology, Ecology and Biotechnology
		CO2. Elaboration of Plant Systematics with description of flowering plants in botanical terms for Plant families like: i. Myrtaceae, ii. Rubiaceae, iii. Solanaceae, iv. Asclepidaceae, v. Amaryllidaceae
		CO3. Study of Ecological adaptations in Hydrophytes and Xerophytes.
		CO4. Study of Vegetation by List-count Quadrat method.
		CO5. Study of tools of Taxonomy and Ecological instruments, Spectrophotometer, Centrifuge and pH meter.
		CO6. Determination of WHC and pH of soil
		CO7. Verification of Plasmolysis, DPD, rate of transpiration, Curling Experiment, Imbibition Pressure, Arc Auxanometer with experimental proofs.
Semester IV	BO 241: Plant Anatomy and Embryology	CO1. Understanding of plant anatomy and types of tissues.
		CO2. Study of Structure and function of epidermal tissue system.
		CO3. Learning of Types and functions of stomata.
		CO4. Study of epidermal outgrowth: glandular and non-glandular.
		CO5. Study and understanding of Mechanical tissue system and Principles involved in distribution of mechanical tissues.
		CO6. Study of Structure and function of xylem, phloem and cambium.
		CO7. Study of Normal secondary growth and Anomalous secondary growth.
		CO8. Understanding of the scope of plant embryology.
		CO9. Study of process and types of Microsporogenesis and Megasporogenesis.
		CO10. Study of details about Endosperm and embryo
	BO 242: Plant Biotechnology	CO1. Understanding of concept, techniques and scope Biotechnology.
		CO2. Learning of properties of enzymes and Classification of enzymes.
		CO3. Learning of method of Production of amylase, proteases and lipase enzyme.
		CO4. Understanding of Fermentation Technology with respect to Bioreactors used and media composition, etc.
		CO5. Study of single cell protein, Introduction and need of proteins in diet.
		CO6. Knowledge regarding the production of SCP from algae (Spirulina) and fungi (Yeast).
		CO7. Understanding of the economic implications of S
	Practical based on BO 241 & BO 242	CO1. Testing seed viability by TTC method
		CO2. Study of Plant Anatomy with respect to Epidermal tissue system, mechanical tissues and their distribution in root, stem and leaves, normal



		secondary growth in dicot stem – Annona , Moringa, anomalous secondary growth in Bignonia and Dracaena stem
		CO3. Study of Plant Embryology with respect to tetrasporangiate anther, types of ovules and dicot and monocot embryo.
		CO4. Estimation of Citric acid in Aspergillus fermentation.
		CO5. Study of the production of single cell protein production i.e. Spirulina, Yeast and study of commercial products
		CO6. Demonstration of fermentation and fermentation products, separation of plasmid DNA by agarose gel electrophoresis and enzyme immobilization

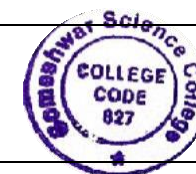
English

	English	1. To introduce the use of English in multimedia
		2. To develop competence among the students to appreciate and analyze short stories and poetry
		3. To acquaint the students with the language skills in multivalent contexts
		4. To acquaint and enlighten students regarding the speaking skill in various contexts
		5. To acquaint and familiarize the students with advanced writing skills in different contexts
		6. To acquaint and familiarize the students with soft skills
		7. To minimize the gap between the existing communicative skills of the students and the skills they require at professional level

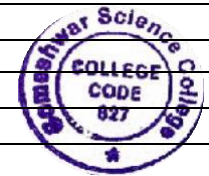
Department of Computer Science

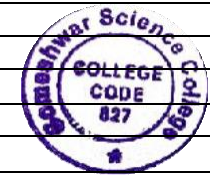
**F.Y. B.Sc.(CS)
(2019 credit Pattern)**

Semester I	CS101 Problem Solving Using Computer and 'C' Programming - I	1. Explore algorithmic approaches to problem solving..
		2. Develop modular programs using control structures and arrays in 'C'
	CS102 Database Management Systems	1 Solve real world problems using appropriate set, function, and relational models..
		2 Design E-R Model for given requirements and convert the same into database tables
		3 Use SQL.
	CS103 Practical course on Problem Solving using Computer and 'C' programming and Database Management Systems	1 Devise pseudocodes and flowchart for computational problems..
		2 Write, debug and execute simple programs in 'C'.
		3 Create database tables in postgreSQL
		4 Write and execute simple, nested queries.
Semester II	CS201 Advanced 'C' Programming	1 Develop modular programs using control structures, pointers, arrays, strings and structures
		2 Design and develop solutions to real world problems using C.
	CS202 Relational Database Management Systems	1 Design E-R Model for given requirements and convert the same into database tables..
		2 Use database techniques such as SQL & PL/SQL
		3 Explain transaction Management in relational database System.
		4 Use advanced database Programming concepts

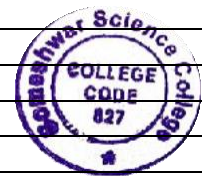


	CS203 Practical Course on Advanced 'C' Programming and Relational Database Management Systems	1. Write, debug and execute programs using advanced features in 'C'. 2 To use SQL & PL/SQL. 3 To perform advanced database operations.
S.Y. B.Sc.(CS) (2019 credit Pattern)		
Semester-III	CS 231 Data Structures and Algorithms – I	1. To use well-organized data structures in solving various problems. 2. To differentiate the usage of various structures in problem solution. 3. Implementing algorithms to solve problems using appropriate data structures.
	CS 232 Software Engineering	1. Compare and chose a process model for a software project development. 2. Identify requirements analyze and prepare models. 3. Prepare the SRS, Design document, Project plan of a given software system.
	CS 233 Practical course on CS 231	CO1. Design and implementation of Data Structures and related algorithms. CO2. Understanding the use of cursors, triggers, views and stored procedures Understanding the steps of system analysis and design.
Semester-IV	CS 241 Data structures and algorithms-II	• Implementation of different data structures efficiently • Usage of well-organized data structures to handle large amount of data • Usage of appropriate data structures for problem solving
	CS 242 Computer Networks-I	1. Have a good understanding of the OSI and TCP/IP Reference Models and in particular have a good knowledge of Layers. 2. Understand the working of various protocols. 4. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
	CS 243 Practical course on CS 241 and CS 242	CO 1 Implementation of different data structures efficiently CO2 Usage of well-organized data structures to handle large amount of data CO 3 Understand the working of various protocols. CO4 Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
T.Y. B.Sc.(CS) (2019 credit Pattern)		
Semester-V	CS - 351 Operating Systems – I	1. Processes and Thread Scheduling by operating system 2. Synchronization in process and threads by operating system 3. Memory management by operating system using with the help of various schemes
	CS - 352 Computer Networks - II	• Student will understand the different protocols of Application layer.. • Develop understanding of technical aspect of Multimedia Systems • Develop various Multimedia Systems applicable in real time. • Identify information security goals



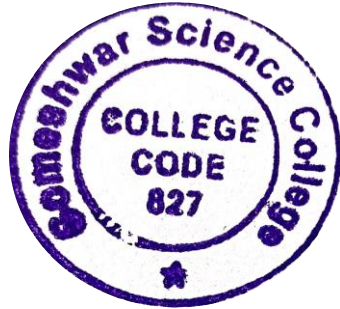



		<ul style="list-style-type: none"> • Understand, compare and apply cryptographic techniques for data security
CS - 353	Web Technologies - I	<ul style="list-style-type: none"> • Understand how to develop dynamic and interactive Web Page
CS - 354	Foundations of Data Science	<ul style="list-style-type: none"> • Perform Exploratory Data Analysis • Present results using data visualization techniques. • Detect and diagnose common data issues, such as missing values, special values, outliers, inconsistencies, and localization. • Demonstrate proficiency with statistical analysis of data. • Obtain, clean/process, and transform data • Prepare data for use with a variety of statistical methods and models and recognize how the quality of the data and the means of data collection may affect conclusions.
CS - 355	Object Oriented Programming using Java - I	<ul style="list-style-type: none"> • Understand the concept of classes, object, packages and Collections. • To develop GUI based application.
CS - 356	Theoretical Computer Science	<ul style="list-style-type: none"> • Understand the use of automata during language design. • Relate various automata and Languages.
CS - 357	Practical Course based on CS - 351	<ol style="list-style-type: none"> 1. Process synchronization 2. Processes and Thread Scheduling by operating system 3. Memory management by operating system using with the help of various schemes
CS - 358	Practical Course based on CS - 353 and CS - 354	<ul style="list-style-type: none"> • Understand how to develop dynamic and interactive Web Page • Prepare data for use with a variety of statistical methods and recognize how the quality of the data may affect conclusions. • Perform exploratory data analysis
CS - 359	Practical Course based on CS - 355	<ol style="list-style-type: none"> 1. Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs. 2. Read and make elementary modifications to Java programs that solve real-world problems. 3. Validate input in a Java program.
CS-3510	Python Programming	<ul style="list-style-type: none"> • Develop logic for problem solving • Determine the methods to create and develop Python programs by utilizing the data structures like lists, dictionaries, tuples and sets. • To be familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc. • To write python programs and develop a small application projec
CS-3511	Blockchain Technology	<ol style="list-style-type: none"> 1. Learn the fundamentals of Blockchain Technology 2. Learn Blockchain programming 3. Basic knowledge of Smart Contracts and how they function



Semester-VI	CS - 361 Operating Systems-II	<ol style="list-style-type: none"> 1. Management of deadlocks and File System by operating system 2. Scheduling storage or disk for processes 3. Distributed Operating System and its architecture and the extended features in mobile OS.
	CS - 362 Software Testing	<ul style="list-style-type: none"> • To understand various software testing methods and strategies. • To understand a variety of software metrics, and identify defects and managing those defects for improvement in quality for given software. • To design test cases and test plans, review reports of testing for qualitative software. • To understand latest testing methods used in the software industries.
	CS - 363 Web Technologies - II	<ul style="list-style-type: none"> • Build dynamic website. • Using MVC based framework easy to design and handling the errors in dynamic website
	CS - 364 Data Analytics	<ul style="list-style-type: none"> • Use appropriate models of analysis, assess the quality of input, and derive insight from results. • Analyze data, choose relevant models and algorithms for respective applications • Understand different data mining techniques like classification, prediction, clustering and association rule mining • Apply modeling and data analysis techniques to the solution of real world business problems
	CS - 365 Object Oriented Programming using Java – II	<ul style="list-style-type: none"> • To access open database through Java programs using Java Data Base Connectivity (JDBC) and develop the application • Understand and Create dynamic web pages, using Servlets and JSP. • Work with basics of framework to develop secure web applications.
	CS - 366 Compiler Construction	<ul style="list-style-type: none"> • Understand the process of scanning and parsing of source code. • Learn the conversion code written in source language to machine language. • Understand tools like LEX and YACC.
	CS - 367 Practical Course based on CS - 361	<ol style="list-style-type: none"> 1. Management of deadlocks by operating system 2. File System management 3. Disk space management and scheduling for processes
	CS - 368 Practical Course based on CS - 363 and CS - 364	<ul style="list-style-type: none"> • Build dynamic website. • Using MVC based framework easy to design and handling the errors in dynamic website.
	CS - 369 Practical Course based on CS - 365	<ol style="list-style-type: none"> 1. To Learn database Programming using Java. 2. Understand and Create dynamic web pages using Servlets and JSP 3. Work with basics of framework to develop secure web applications
	CS - 3610 Software Testing Tools	<ul style="list-style-type: none"> • To understand various software testing methods and strategies.

		<ul style="list-style-type: none">• To understand a variety of software metrics and identify defects and managing those defects for improvement in quality for given software.
		<ul style="list-style-type: none">• To design test cases and test plans, review reports of testing for qualitative software.
		<ul style="list-style-type: none">• To understand latest testing tools used in the software industries.




Principal
Someshwar Science College, Someshwaramagar

PROGRAM SPECIFIC OUTCOMES (PSOs) FOR UNDERGRADUATE COURSES

1. Program: B.Sc. (Chemistry)

PSOs	Program Specific Outcomes
PSO1	Develop abilities to apply the knowledge of contents of principles of Chemistry.
PSO2	Develop the power of appreciation, the achievements in Chemistry and its role in nature as well as in the social order
PSO3	Able to handle instruments for basic and modern chemical analysis.
PSO4	Safe-handling of chemical materials, taking into account their physical and chemical properties including any specific hazards associated with their use and the ability to conduct risk assessments
PSO5	Students followed and understood general laboratory practice guidelines, including safety
PSO6	Evaluation, interpretation and synthesis of chemical information and data

2. Program: B.Sc. (Mathematics)

PSOs	Program Specific Outcomes
PSO1	Give the students a sufficient knowledge of fundamental principles, methods and a clear perception of innumerable power of mathematical ideas and tools and know how to use them by modeling, solving and interpreting.
PSO2	To equip the students sufficiently in both analytical and computational skills in Mathematical Sciences.
PSO3	To develop a competitive attitude for building a strong academic - industrial collaboration, with focus on continuous learning skills.
PSO4	Enhancing students overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
PSO5	Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study
PSO6	Enabling students to Gauge the hypothesis, theories, techniques and proofs provisionally.

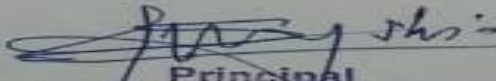
3. Program: B.Sc. (Microbiology)

PSOs	Program Specific Outcomes
PSO1	Enrich students' knowledge and train them in the pure microbial sciences,
PSO2	Students are trained in designing protocols, carrying out experimentation, preparing manuals, instrumentation, perfection in skills.
PSO3	Understand the principles of applications of microorganisms in industry and soil
PSO4	Use the genetic engineering tools to modify the microorganisms to improve desirable Properties.
PSO5	Equip students to work in pathological labs, blood banks, hospitals, diagnostic research centers, public health centers, research labs, vaccine industries.

4. Program: B.Sc. (Computer science)

PSOs	Program Specific Outcomes
PSO1	Build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
PSO2	Develop requisite professional skills and problem solving abilities for pursuing a career in Software Industry.
PSO3	Able to develop necessary knowledge base for research and development in Computer Science.
PSO4	Able to interact with the related fields such as electronics, -mathematics.
PSO5	Able to involve in different fields such as Management, Marketing, Government sectors and Competitive examinations.




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PROGRAM SPECIFIC OUTCOMES (PSOs) FOR POSTGRADUATE COURSES

1. Program: M.Sc. (Organic Chemistry)

Program Specific Outcomes

PSOs	Program Specific Outcomes
PSO1	To educate and prepare post graduate students from rural and urban area who will get employment on large scale in academic institutes, R & D and Quality control laboratories of Indian chemical/pharmaceutical industries as well as multinational and forensic Laboratories.
PSO2	To provide students with broad theoretical and applied background in all specialization of Chemistry with emphasis on qualitative and quantitative technique.
PSO3	To provide broad common frame work of syllabus to expose our young graduates to the recent and applied knowledge of interdisciplinary branches of chemistry involving applied organic, inorganic, physical, analytical, industrial, pharmaceutical, polymer, Nano science & technology.
PSO4	To conduct lesser written tests and to encourage on non-written tests
PSO5	Understand the official method of standardization and quality control.
PSO6	Understand the data handling and knowing accuracy, precision, Standard deviation and regression etc.
PSO7	Know the broad and in depth understanding of ideas central to chemistry.




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PROGRAM OUTCOMES (POs) FOR UNDERGRADUATE COURSES

1. Program: B.Sc.

After completing the Bachelor of Science degree, students are able to:

POs	Program Outcomes
PO1	Obtain knowledge with facts and figures related to various subjects in basic sciences such as Physics, Chemistry, Biology, Mathematics, etc.
PO2	Understand the fundamental concepts, principles, and scientific theories related to various scientific phenomena and their relevance in daily life.
PO3	Acquire expertise in handling scientific instruments, planning and performing laboratory experiments nothing losing the observations and drawing logical inferences from them.
PO4	Evaluate the given scientific data critically and systematically and drawing objective conclusions.
PO5	Able to think creatively (divergently and convergent) to propose novel ideas in explaining facts or providing new solution to the problems.
PO6	Develop the scientific outlook not only with respect to science subjects but also in all aspects related to life.
PO7	Absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality.
PO8	Realize the knowledge of subjects in other faculties such as humanities, performing arts, social sciences etc can greatly and effectively influence & inspire in evolving new scientific theories and inventions.

2. Program: B.Sc. (Computer Science)

After completing the three year degree in Computer Science, students are able to:

POs	Program Outcomes
PO1	Students understand the nature of the software development process, including the need to provide appropriate documentation.
PO2	Understand the major programming paradigms and be able to learn a new programming language in a fairly short time.
PO3	Able to analyse a problem, construct alternate approaches to its solution and evaluate the merits and demerits of each.
PO4	Understand the conceptual underpinnings of the subject.
PO5	Understand the importance and the nature of operating systems and compilers.




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PROGRAM OUTCOMES (POs) FOR POSTGRADUATE COURSES

1. Program: M.Sc. (Organic Chemistry)

After Completing the Master degree in Organic Chemistry, students are able to:

POs	Program Outcomes
PO1	Acquire knowledge, abilities and insight in well-defined area of research within Chemistry.
PO2	Work as a Chemistry professional, and qualify for training as scientific researcher.
PO3	Develop knowledge of scientific theories and methods, gain experience in working independently with scientific questions and clearly express their opinion on academic issues.
PO4	Develop communication skills, both written and oral, for specialized and non-specialized audiences.
PO5	Acquire the skills of planning and conducting advanced chemical experiments and applying structural-chemical characterization techniques.
PO6	Examine specific phenomena theoretically and/or experimentally, contribute to the generation of new scientific insights or to the innovation of new applications of research in Chemistry.




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