Petlad Education Trust Managed

Shri R. K. Parikh Arts and Science College, Petlad

Accredited by NAAC B+ Grade (2017-2022)

PHYSICS DEPARTMENT

B. Sc. Physics

Program Outcomes, Program Specific Outcomes and Course Outcomes

The student graduating with the Degree B.Sc. Physics should be able to acquire

Program Outcomes (POs)	**1.** a fundamental and systematic understanding of the academic field of Physics, its different learning areas and applications in basic Physics like Mechanics, Thermodynamics, Electromagnetics, Solid state physics, Optics, Nuclear and Particle Physics, Condensed matter Physics, Atomic and Molecular Physics, Mathematical Physics, Material science and its linkages with related disciplinary areas/subjects like Chemistry, Mathematics, Environmental sciences, Atmospheric Physics, Computer science, Information Technology. **2.** Demonstrate the ability to use skills in Physics and its related areas of technology for formulating and tackling Physics-related problems and identifying and applying appropriate physical principles and methodologies to solve a wide range of problems associated with Physics. **3.** Recognize the importance of mathematical computing and the role of approximation and mathematical approaches to describing the physical world. **4.** Plan and execute Physics-related experiments or investigations, analyze and interpret data/information collected using appropriate methods and report accurately the findings of the experiment/investigations while relating the conclusions/findings to relevant theories of Physics. **5.** Demonstrate relevant generic skills and global competencies such as (i) problem-solving skills that are required to solve different types of Physics-related problems with well-defined solutions, and tackle open-ended problems that belong to the disciplinary-area boundaries; (ii) investigative skills, including skills of independent investigation of Physics-related issues and problems; (iii) communication skills involving the ability to listen carefully, to read texts and research papers analytically and to present complex information in a concise manner to different groups/audiences of technical or popular nature; (iv) analytical skills involving paying attention to detail and ability to construct logical arguments using correct technical language related to Physics and ability to translate

	them with popular language when needed; (v) ICT skills; (vi) personal skills such as the ability to work both independently and in a group. **6.** Demonstrate professional behaviour such as (i) being objective, unbiased and truthful in all aspects of work and avoiding unethical, irrational behaviour such as fabricating, falsifying or misrepresenting data or committing plagiarism; (ii)the ability to identify the potential ethical issues in work-related situations; (iii) appreciation of intellectual property, environmental and sustainability issues; and (iv) promoting safe learning and working environment.
Program Specific Outcomes (PSOs)	**1.** Understand the core concept of Physics subjects. **2.** Acquire analytical and logical skill for higher Education. **3.** Excel in Experimental and Theoretical Physics. **4.** Trained to take up jobs in allied fields. **5.** Confident to take up competitive exams
Course Outcomes B.Sc. Physics **Semester-1**	
Course	**Outcome** After completion these courses students should be able to
US01CPHY21 Mechanics-I, Network Analysis and Optics (credit-4)	**1.** Understand the principles of elasticity through the study of Young Modulus and modulus of rigidity. Relation connecting the elastic constants, study of Poisson's ratio, torsional pendulum, Maxwell's vibrating method and bending of beams. **2.** Describe the production, detection of ultrasonic waves and applications. **3.** Explain the phenomena of simple harmonic motion and the properties of systems executing such motions. **4.** Understand the network terminology, various network theorem, d.c. and a.c. bridge circuit analysis. **5.** Use the principles of wave motion and superposition to explain the Physics of interference. Understand the working of selected optical instruments like interferometer, diffraction grating and resolving power of various optical instruments.
US01CPHY22 (Practical) (credit-2)	In the laboratory course, the student shall perform experiments related to mechanics (compound/torsional pendulum), elastic properties (Young Modulus and Modulus of Rigidity), Zener diode, conersion of various electric meters etc.

Course Outcomes B.Sc. Physics

Semester-2

Course	Outcome After completion these courses students should be able to
US02CPHY21 Mechanics-II, Basic Electronics and LASER (Credit-4)	**1.** Understand the role of vectors and coordinate systems in Physics. Study of various theorems like Gauss Theorem, Greens Theorem and Stokes Theorem. **2.** Understand Special theory of Relativity studying Galilean transformation, Lorentz transformation of space and time, Length contraction, Time dilation, Variation of mass with velocity and Equivalence of mass and energy. **3.** Explain rectifier circuits, filter circuits for power supply, various types of diodes and NPN and PNP transistors and basic configurations namely common base, common emitter and common collector, and also about current and voltage gain.. **4.** Understand the spontaneous and stimulated emission of radiation, optical pumping and population inversion. ND:YAG LASER, CO_2 LASER, holography and application of LASER.
US02CPHY22 (Practical) (credit-2)	In the laboratory course, the student shall perform experiments related to rotational dynamics (Flywheel), optics (Resolving power of grating, Newton's ring), power supply using rectifier circuits and transistor characteristics.

Course Outcomes B.Sc. Physics

Semester-3

Course	Outcome After completion these courses students should be able to
US03CPHY21 Optics (Credit-4)	**1.** Understand lens systems, cardinal points for various lens systems, various types of lens aberrations and different eyepieces and their comparisons. **2.** Explain several phenomena we can observe in everyday life that can be explained as wave phenomena. **3.** Use the principles of wave motion and superposition to explain the Physics of polarisation, interference and diffraction. **4.** Understand Optical fibre system, propagation of light through optical fibre, modes of propagation, classification and applications.

US03CPHY22 Basic Solid State Electronics (credit-4)	**1.** Understand working of various transistor biasing circuits and its approximate and accurate analysis. **2.** Explain the small signal amplifier circuits, calculation of gain, hybrid parameter equivalent circuits and analysis and various coupling methods. **3.** Describe concepts of feedback, feedback amplifier circuits and calculation of its gain, RC coupling and emitter follower circuit. **4.** Understand oscillator circuits (Hartley oscillator, Colpitts oscillator, Phase shift oscillator, Wien bridge oscillator) **5.** Comprehend the operation and characteristics of JFET and MOSFET.
US03CPHY23 (Practical) (credit-2)	**1.** In the laboratory course, student will gain hands-on experience of using various optical instruments and making finer measurements of wavelength of light using biprism experiment, Hartmann's formula etc. Resolving power of optical equipment can be learnt firsthand. **2.** To characterize various devices namely PNP and NPN transistors, biasing circuits and study of LCR resonant circuits. Also construct amplifiers and oscillators using discrete components.

Course Outcomes B.Sc. Physics

Semester-4

Course	**Outcome** After completion these courses students should be able to
US04CPHY21 Electromagnetic Theory and Spectroscopy (Credit-4)	**1.** Demonstrate Gauss law, Coulomb's law for the electric field, and apply it to systems of point charges as well as line, surface, and volume distributions of charges. **2.** Explain and differentiate the vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics. · Apply Gauss's law of electrostatics to solve a variety of problems. **3.** Explain Lorentz force law and The Biot-Savart law to articulate the relationship between electric and magnetic fields. **4.** Describe the magnetic field produced by magnetic dipoles and electric currents and the phenomena of dia, para and ferromagnetism. **5.** Understand investigation, production and types of atomic spectra.

	6. Explain the L-S, J-J coupling, Zeeman effect and Paschen-Back effect. **7.** Describe X-ray Spectra, its measurement and diffraction of X-ray. Also characteristics and close survey of emission spectra .
US04CPHY22 Classical, Quantum and Solid State Physics (credit-4)	**1.** Understand the gravitational and electrostatic forces, general features of motion, motion in an inverse square law force field and Keplar's laws planetary motion. **2.** Understand De-Broglie hypothesis and Uncertainty principle. **3.** After an exposition of inadequacies of classical mechanics in explaining microscopic phenomena, quantum theory formulation is introduced through Schrodinger equation. **4.** The interpretation of wave function of quantum particle and probabilistic nature of its location and subtler points of quantum phenomena are exposed to the student. **5.** A brief idea about crystalline and amorphous substances, about lattice, unit cell, miller indices, reciprocal lattice, concept of various crystal structures and other cubic structures. **6.** Knowledge of interatomic force and bonding in solids.
US04CPHY23 (Practical) (credit-2)	**1.** In the laboratory, student has sufficient knowledge of various oscillator circuits, bridge circuits and determination and verification of gravity of acceleration and stefan's law. **2.** To carryout experiments like Miller indices using X-ray diffraction, de-Broglie Relation using electron diffraction pattern, Wave length of a monochromatic light using double slit method, photocell, Identification of chemical elements using absorption spectra, numerical integration and analysis of errors.
Course Outcomes B.Sc. Physics **Semester-5**	
Course	**Outcome** After completion these courses students should be able to
US05CPHY21 Classical Mechanics (Credit-4)	**1.** Understand the generality of generalized coordinates and will be able to apply for the study of the mechanics of classical systems. **2.** Explain the effect of rotational motion of the earth and its effect on weather conditions. **3.** Get an idea of inertia and symmetry of rigid bodies, variational method for motion of the system as another formulation to solve mechanical problems. Understand the production of Hamiltonian function and use of Lagrangian and Hamiltonian formulation for the study related to motion of classical systems.

US05CPHY22 Mathematical Methods (Credit-4)	**1.** Describe the general features of curvilinear coordinate systems and its deductions to any particular coordinate system. **2.** Explain the importance of some special harmonic functions and their properties. **3.** explain how Fourier series can be applied to solve certain types of differential equations. **4.** Understand the students will be able to apply the numerical methods for solving various physical problems which are difficult to study analytically as well as how to analyze the experimental data.
US05CPHY23 Thermodynamics and Statistical Mechanics (Credit-4)	**1.** Understand the laws and mathematical formulations of thermodynamics, the concept of entropy etc. **2.** Describe the behavior of different states of matter under thermal environment. **3.** Explain the fundamental concept of statistical mechanics like phase space, micro canonical ensemble as isolated system and canonical ensembles which allows exchange of energy. **4.** Elucidate the partition functions and MB, BE, FD statistical distribution of particles with distinct intrinsic properties such as classical gas, Fermionic gas and Bosonic gas etc.
US05CPHY24 Analog and Digital Circuits (Credit-4)	**1.** Explain Transistor amplifiers and their analysis for different range of frequencies. **2.** Describe the power capabilities of transistor power amplifiers and various techniques to achieve higher efficiency. **3.** Understand the basic structure of Operational Amplifier and its analysis with its wide applications. **4.** Analyse different number systems and different types of gates, flip-flops, registers and counters which are essential components of digital electronic technology.
US05CPHY25 (Practical) (Credit-6)	**1.** In the laboratory course, the student gets an opportunity to perform experiments Demonstrating principles of operation and functions of CRO, Interferometer, electronic circuits etc. **2.** Various properties of the materials like resistivity, Hall coefficient, energy band gap, thickness of film etc. **3.** The numerical methods to analyze the observational data as well as the applications of numerical methods to solve dynamics of Physics problems.
US05DPHY26 Renewable Energy Sources	**1.** The various sources of renewable energy and their conversion methods.

(Discipline Specific Elective) (Credit-2)	**2.** Describe the use of solar energy and the various components used in the energy production. **3.** Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications. **4.** They will be able to gain the knowledge of various fuel cells and power plants.
US05DPHY27 Astronomy and Astrophysics (Discipline Specific Elective) (Credit-2)	**1.** Understand Basic concept of astronomy and astrophysics and working of various tools used in astronomical observations, their sensitivity and applications. **2.** Achieve an understanding of the Physical properties of our sun, the characterization of stars, evolution of stars etc. **3.** Understand Galaxies including Milky way galaxy and other cosmic events.

Course Outcomes B.Sc. Physics

Semester-6

Course	**Outcome** After completion these courses students should be able to
US06CPHY21 Quantum Mechanics (Credit-4)	**1.** Understand the basic concepts of quantum mechanics. **2.** Study the Bound State problems. **3.** Understand the requirement of normalization of the wave function, interpretation of the normalized wave function etc. **4.** Get familiar with the methods of solving exactly solvable problems in quantum mechanics.
US06CPHY22 Atomic and Molecular Spectroscopy (Credit-4)	**1.** Understand and be able to apply atomic and molecular spectroscopy. **2.** Understand the motions of atoms and molecules within a macroscopic substance. **3.** Understand infrared and Raman Spectra through Classical and quantum theory and their potential applications.
US06CPHY23 Solid State Physics & Nuclear Physics (Credit-4)	**1.** Explain the application of X-ray diffraction techniques to determine the structure and symmetry of various solid materials. **2.** Describe the electrical and thermal conductivity of metals based on free electron gas model and the effect of free charge carriers under electric and magnetic fields. **3.** Understand the basic properties of nucleus, different types of nuclear reaction processes and Q- value equation through which the energy release in nuclear reactions like fission can be estimated.

	4. Understand properties of nucleus as a charged liquid drop and the success and failures of liquid drop model. **5.** Explain the experimental techniques used to produce highly energetic nuclear and sub nuclear particles in accelerators. **6.** Get familiar with the functions of and applicability of different detectors used to detect nuclear and sub nuclear particles.
US06CPHY24 Electrodynamics and Plasma Physics (Credit-4)	**1.** Understand the behavior of electric and magnetic fields in matter. **2.** Explain various laws of electro statics and magneto statics, electromotive force, electromagnetic induction and their applications. **3.** Better understanding of contribution of Maxwell in the formation of Maxwell's equations and its physical implications. **4.** Understand the basic plasma properties, motion of charged particles in various conditions of electric and magnetic fields and its plasma waves
US06CPHY25 (Practical) (Credit-6)	**1.** In the laboratory course, the student gets an opportunity to understand the basic principles of Physics related to their courses in a practical way. **2.** The students gain knowledge of operational details of CRO, Interferometer and electronic circuits etc. **3.** The experimental design aspects to determine various properties of materials like resistivity, Hall coefficient, energy band gap, thickness of film etc. **4.** The process to analyze the observations and infer the outcome of the experiment.
US06DPHY26 Transducers and Sensors (Discipline Specific Elective) (Credit-2)	**1.** Use the cathode ray oscilloscope for measurements of various quantities of electrical signals like, frequency, phase and amplitude. **2.** Identify and design the required transducers for measurements of various physical parameters like pressure and temperature at different level. **3.** Understand how to use optical fibre as sensors for various physiological parameters like blood pressure, blood flow rate, oxygen saturation in blood and etc.
US06DPHY27 Electronic Communications (Discipline Specific Elective) (Credit-2)	**1.** Understand various components of electronic communication systems, the importance of modulations, and the advantages of amplitude, frequency and phase modulation etc. **2.** Describe basics of satellite communications and types of data communication and network analysis.

Petlad Education Trust Managed

Shri R. K. Parikh Arts and Science College, Petlad

Accredited by NAAC B+ Grade (2017-2022)

CHEMISTRY DEPARTMENT

B. Sc. Chemistry

Program Outcomes, Program Specific Outcomes and Course Outcomes

The student graduating with the Degree B.Sc Chemistry should be able to acquire

Program Outcomes (PO)	**1.** A fundamental and systematic understanding of the academic field of Chemistry, its different learning areas and applications in basic Chemistry like organic chemistry, inorganic chemistry, physical chemistry, analytical chemistry, role of drugs in our life, pesticide structure and their behaviour, nuclear chemistry, polymer chemistry and different approaches of structural chemistry etc. with related disciplinary areas/subjects like Physics, Biology, Microbiology, Environmental sciences, **2.** Students will demonstrate an understanding of major concepts in all disciplines of chemistry. **3.** Students will employ critical thinking and the scientific method to design, carry out, record and analyze the results of chemical experiments and get an awareness of the impact of chemistry on the environment, society and other cultures outside the scientific community. **4.** Use modern techniques, decent equipments and Chemistry software's.
Program Specific Outcomes (POS)	**1.** Gain the knowledge of Chemistry through theory and practical's **2.** The ability to explain chemical nomenclature, structure, reactivity, and function in their specific field of chemistry. **3.** Use modern chemical tools, Models, Chem-draw, Charts and Equipments. **4.** The design and execution of the experiment should demonstrate an understanding of principles of different analytical techniques, reagents properties and its specific use. **5.** To learn the proper handling of chemical waste streams and also explain how the applications of Chemistry relates to the real world. **6.** After completion of this program students are eligible for admissible in Master degree program. **7.** Understand the core concept of Chemistry subjects.

	8. Acquire analytical and logical skill for higher Education. **9.** Trained to take up jobs in allied fields. **10.** Confident to take up competitive exams
Course Outcomes B.Sc. Chemistry Semester-1	
Course	**Outcome** After completion these courses students should be able to
US01CCHE21 GENERAL CHEMISTRY- I (credit-4)	**1.** This paper course contains chemistry of alkane, alkene and alkyne, periodic properties, ionic equilibria in aqueous solutions and analytical chemistry etc. **2.** The paper provides basic opportunities to students to revive their knowledge and depth of understandings of basic general chemistry. The paper is precisely designed to cover fundamental aspects of all the major branches of chemistry viz. Organic Chemistry, Inorganic chemistry, Physical Chemistry and Analytical chemistry **3.** After completion of whole paper students would have cleared basic aspects of the chemistry as a subject and would have a profound pillar for upcoming syllabus.
US01CCHE22 (Practical) (credit-2)	**1.** To enable to the students to learn about the identification of organic substance, volumetric titrations of acid base. **2.** In this paper students are required to perform qualitative analysis of organic substance. Students get knowledge about detection of elements, nature of organic compounds, functional group identification, and compound identification. **3.** After studying this course student will be able to learn practicals for succeeding semester's in the subject of organic chemistry and quantitative analysis.
Course Outcomes B.Sc. Chemistry Semester-2	
Course	**Outcome** After completion these courses students should be able to
US02CCHE21 GENERAL CHEMISTRY- II (Credit-4)	**1.** To enable to the students to learn about alkyl and aryl halides, chemical bonding in variety of molecules by using various theories, introduction, structure and properties of organic molecules and of d-block elements and fundamental concept of coordination chemistry and chemical kinetics

	2. The paper provides basic opportunities to students to revive their knowledge and depth of understandings of basic general chemistry. The paper is niftily designed covering of fundamental aspects of all the major branches of chemistry viz. Organic Chemistry, Inorganic chemistry, Physical Chemistry and. Analytical chemistry 3. After completion of whole paper students would have cleared basic aspects of the chemistry as a subject and would have a profound pillar for upcoming syllabus.
US02CCHE22 (Practical) (credit-2)	1. Practical is an integral part of any chemistry branch. This paper offers inorganic qualitative analysis and volumetric titration of part to students. 2. Upon completion of this paper, students are able to employ critical thinking and scientific inquiry in the performance, design, interpretation and documentation of laboratory experiments, at a level suitable to succeed in future laboratory encounters.
Course Outcomes B.Sc. Chemistry Semester-3	
Course	**Outcome** After completion these courses students should be able to
US03CCHE21 Inorganic Chemistry (Credit-4)	1. This inorganic chemistry course contains chemistry of acid-base and non-aqueous solvent, valance bond theory and isomerism in coordination compounds, lanthanides and actinides and chemistry of metal carbonyl and nitrosyls etc. 2. After studying this course student will be able to learn inorganic chemistry subject.
US03CCHE22 Physical Chemistry (credit-4)	3. This is the basic physical chemistry course designed to understand states of matter, chemical thermodynamics, colligative properties of dilute solutions and electrolytes in solution etc. 4. After studying this course student will be able to learn succeeding semester's physical chemistry subject.
US03CCHE23 (Practical) (credit-2)	1. This course is designed to learn separation and identification of four component inorganic radicals, as well as semi-micro analysis of inorganic radicals. After studying this course student will be able to learn practical of semester-5 viz. US05CCHE25. Moreover student will learn about quantitative analysis. 2. This practical course is designed to learn Volumetric Titration, Preparation of standard solutions and Paper chromatography.
US03SICT21	1. Describe basics of computer system including components of general purpose computer system, generations of computer languages and various operating systems.

Information and Communication Technology – I (Skill Enhancement Elective Course) (Credit-2)	**2.** Explain the input and output devices. **3.** Describe the storage devices like hard disk,CD, DVD, pen drive, memory cards and its advantages and disadvantages. **4.** Explain different types of networks like LAN, MAN, WAN and network topology.

Course Outcomes B.Sc. Chemistry Semester-4

Course	Outcome After completion these courses students should be able to
US04CCHE21 Organic Chemistry (Credit-4)	**1.** This is the basic organic chemistry course designed to understand stereochemistry of organic compounds, chemistry of alcohol, phenol, aldehyde, ketones, amines, Carbohydrates and Chemical Reactivity and Molecular Structure. **2.** After studying this course student will be able to learn succeeding semester's organic chemistry subject viz., US05CCHE21, US06CCHE21.
US04CCHE22 Analytical Chemistry (credit-4)	**1.** This paper targets phase titrimetric methods in analysis, neutralization titration, complexometric titration, redox titration and water pollutants analysis. **2.** These topics have great importance in analytical chemistry. The topics covered in this paper are perfectly designed so that students can achieve great exposure about these topics. **3.** The paper will be helpful for them in industry as well as research
US04CCHE23 (Practical) (credit-2)	**1.** This course is designed to learn separation and identification of Binary organic mixture, as well as Gravimetric analysis (quantitative analysis). **2.** After studying this course student will be able to learn practical of semester VI viz. US06CCHE25.
US04SICT21 Information and Communication Technology – II (Skill Enhancement Elective Course) (Credit-2)	**1.** Explain Internet and Communication technology which include web browsers, email, FAX and mobile communication. **2.** Understand basics of HTML, tags and structure of HTML documents. **3.** Basic concepts of E-commerce like classification by nature of transaction, non and intra business E-commerce and limitations and future of E-commerce. **4.** Understand the effect of ICT on employment, reliability of content available, security of data transfer on internet and computer viruses and antivirus software.

Course Outcomes B.Sc. Chemistry Semester-5

Course	Outcome After completion these courses students should be able to

US05CCHE21 Organic Chemistry (Credit-4)	**1.** Student will learnt about basic concept of heterocyclic chemistry, reaction mechanism, dienes and macromolecules and terpenoids. **2.** This study will helpful them in further studies and in industries.
US05CCHE22 Inorganic Chemistry (Credit-4)	**1.** Student will learnt about basic concept of symmetry, crystal field theory, geometry of the molecule, stability of metal complexes and inorganic polymers. **2.** This study will helpful them in further studies and in industries.
US05CCHE23 Physical Chemistry (Credit-4)	**1.** Student will learnt about basic concept of entropy and chemical kinetics. Also will be able to understand basics of photo chemistry and surface chemistry. **2.** This study will helpful them in further studies and in industries.
US05CCHE24 Analytical Chemistry (Credit-4)	**1.** Student will learnt about basic concept of instrumental techniques, chromatography and solvent extraction methods. **2.** This study will helpful them in further studies and in industries.
US05CCHE25 (Practical) (Credit-6)	**1.** This course is designed to learn separation and identification of six component inorganic radicals, as well as semi-micro analysis of inorganic radicals. After studying this course student will be able to learn separation and identification of inorganic radicals from unknown substance or ore. **2.** This paper contains estimation and preparation exercise. This paper helps them to build up their knowledge of materials and hands on training of reactions and reaction conditions. The work-up procedures they follow help them to build up knowledge of filtration and crystallization procedures. **3.** In the laboratory course, students will learn hands on training of instruments like pH metry, Potentiometry , Conductometry. **4.** This study will helpful them in further study and in industries.
US05DCHE26 ORGANIC SPECTROSCOPY (Credit-2)	**1.** Student will learnt about basic principal and application of spectroscopy specially Ultraviolet Spectroscopy, Infrared Spectroscopy. **2.** This study will helpful them in further studies and Industry.

Course Outcomes B.Sc. Chemistry Semester-6

Course	**Outcome** After completion these courses students should be able to
US06CCHE21 Organic Chemistry (Credit-4)	**1.** Student will learnt about basic concept of Amino Acids And Proteins, Purine and Pyrimidines, alkaloids, Synthetic Dyes and Organic Photochemistry. **2.** This study will helpful them in further studies and in industries.
US06CCHE22 Inorganic Chemistry (Credit-4)	**1.** Student will learnt about basic concept of wave mechanics, organo metallic compounds, cyclopentadienyl complexes term symbol, electronic spectra of metal complexes and principles of metallurgy. **2.** This study will helpful them in further studies and in industries.

US06CCHE23 Physical Chemistry (Credit-4)	**1.** Student will learnt about basic principles of thermodynamics and electrochemistry. Also will be able to understand basics of catalysis and phase equillibria. **2.** This study will helpful them in further studies and in industries.
US06CCHE24 Applied Chemistry (Credit-4)	**1.** Student will learnt about basic concept of principles of NMR Spectroscopy, Drugs, Bioinorganic chemistry and Heavy chemicals. **2.** This study will helpful them in further studies and in industries.
US06CCHE25 (Practical) (Credit-6)	**1.** This paper contains chemical kinetics, refractometry, determination of adsorption co-efficient like exercises. This paper helps them to build up their knowledge of physical chemistry and to understand fundamentals of physical chemistry in practical aspects. It will beneficial in their higher studies M.Sc and research. **2.** This practical course is designed to learn separation and identification of three component of organic substances. After studying this course student will be able to learn separation of product from the crude product. It will beneficial in their higher studies M. Sc and research as well as in R & D section of Industry. **3.** This practical course is in conjunction with previous practical where they learned qualitative analysis whereas here they perform quantitative analysis using gravimetric, volumetric and Inorganic Preparation methods. It will beneficial in their higher studies M. Sc and Ph.D.
US06DCHE22 SELECTED TOPICS IN CHEMISTRY-2 (Discipline Specific Elective) (Credit-2)	**1.** Student will learnt about basic principles of titration techniques, chemistry of α, β -dicarbonyl compounds and chemical aspect of fertilizers. **2.** This study will helpful them in further studies and in industries.

Petlad Education Trust Managed

Shri R. K. Parikh Arts and Science College, Petlad

Accredited by NAAC B+ Grade (2017-2022)

S.K. MICROBIOLOGY DEPARTMENT

B. Sc. Microbiology

Program Outcomes, Program Specific Outcomes and Course Outcomes

A candidate who is conferred an UG degree i.e. B.Sc. degree in Microbiology needs to have acquired/developed following competencies during the programme of the study:

Program Outcomes (PO)	1. Acquired knowledge and understanding of the microbiology concepts as applicable to diverse areas such as medical, industrial, environment, genetics, agriculture, food and others. 2. Demonstrate key practical skills/competencies in working with microbes for study and use in the laboratory as well as outside, including the use of good microbiological practices. 3. Competent enough to use microbiology knowledge and skills to analyze problems involving microbes, articulate these with peers/ team members/ other stake holders, and undertake remedial measures/ studies etc. 4. Developed a broader perspective of the discipline of Microbiology to enable him to identify challenging societal problems and plan his professional career to develop innovative solutions for such problems.
Program Specific Outcomes (POS)	1. Understand the core concept of Microbiology subjects. 2. Acquire analytical and logical skill for higher Education. 3. Excel in Experimental and Theoretical Microbiology. 4. Trained to take up jobs in allied fields. **5.** Confident to take up competitive exams.

Course Outcomes B.Sc. Microbiology

Semester-1 – Not Applicable	
Course	Microbiology is not offered as a core subject to first year students.
Course Outcomes B.Sc. Microbiology **Semester-2- Not Applicable**	
Course	Microbiology is not offered as a core subject to first year students.
Course Outcomes B.Sc. Microbiology **Semester-3**	
Course	**Outcome** At the completion of this course, the students are able to -
US03CMIC21 Elements of Microbiology (Credit-4)	**1**. Have developed a good knowledge of the development of the discipline of Microbiology and the contributions made by prominent scientists/ microbiologists in this field. **2**. Have developed a very good understanding of the characteristics of different types of microorganisms, methods to organize/classify these into and basic tools to study these in the laboratory. **3**. Has acquired a fairly good understanding of the Diversity of the microbes. **4**. Has acquired a fairly good understanding of the activities/importance of microbes. **5**. Describe characteristics of bacterial cells, cell organelles, cell wall composition and various appendages like capsules, flagella or pili. **6**. Differentiate a large number of common bacteria by their salient characteristics; classify bacteria into groups. **7**. Has acquired a fairly good understanding of the different types of bacteria.
US03CMIC22 Microbial Physiology (Credit-4)	**1**. Describe the nutritional requirements of bacteria for growth; developed knowledge and understanding that besides common bacteria there are several other microbes which grow under extreme environments. **2.** Has acquired a fairly good understanding of bacterial growth curve, generation time, growth rate and types of bacterial growth. 3. Has acquired knowledge of controlling microorganisms using different physical and chemical agents.

US03CMIC23 (Practical) (Credit-2)	1. In the laboratory course, the student gets an opportunity to perform experiments. 2. Has acquired information of principles of operation, working and functions of autoclave, incubator, hot air oven, colony counter, pH meter etc. 3. Has acquired skills of visualizing bacteria by staining, using a microscope and culturing bacteria in microbiological media to describe the features of bacterial colonies. 4. Has acquired knowledge of effect of environmental factors on growth of bacteria.
US03SICT21 Information and Communication Technology – I (Skill Enhancement Elective Course) (Credit-2)	**1.** Describe basics of computer system including components of general purpose computer system, generations of computer languages and various operating systems. **2.** Explain the input and output devices. **3.** Describe the storage devices like hard disk,CD, DVD, pen drive, memory cards and its advantages and disadvantages. **4.** Explain different types of networks like LAN, MAN, WAN and network topology.

Course Outcomes B.Sc. Microbiology

Semester-4

Course	**Outcome** After completion these courses students should be able to:
US04CMIC21 Environmental Microbiology (Credit-4)	**1.** Has acquired a fairly good understanding of the habitats of microorganisms: in soil, aquatic conditions, atmosphere and under extreme conditions. 2. Developed a clear understanding of the multifarious roles of microorganisms in soil. 3. Has acquired a fairly good understanding of different types of microbes in the soil. 4. Has developed a fairly good understanding of the role microorganisms in biogeochemical recycling of different elements, nitrogen fixation, organic matter degradation, use as bio fertilizers, etc. 5. Has acquired a fairly good understanding of different types of waters, presence of harmful types of microorganism in water, and role of microorganisms in waste water treatment.

	6. Has acquired basic information of analysis of quality of water and methods used for purification of drinking water.
US04CMIC22 Elements of Microbiology-II (Credit-4)	1. Are able to explain the useful and harmful activities of the microorganisms. 2. He should familiar with the general characteristics of fungi, algae, protozoa and viruses and their significance. **3**. Has acquired a fairly good understanding of the role of microorganisms in spoilage of food and milk, and their role in the production of homemade fermented foods and fermented dairy products. **4**. Are able to identify the role of microorganisms in the causation of the diseases and how to protect against food-borne pathogens. **5**. Are able to describe the role of microorganisms in the production of fermented foods and fermented dairy products, like cheese, butter milk, kefir,yogurt, etc. 6. Has acquired a fairly good understanding of qualitative and quantitative analysis of food and milk.
US04CMIC23 (Practical) (Credit-2)	**1**. Have developed a very good understanding and skills of qualitative and quantitative bacteriological analysis of water, food, milk, soil and air. **2.** Developed experimental skills for testing the milk and different foods for the presence of microorganisms. 3. Has acquired skills of culturing fungi and nitrogen fixing bacteria in microbiological media to describe the features of cultural characteristics.
US04SICT21 Information and Communication Technology – II (Skill Enhancement Elective Course) (Credit-2)	**1.** Explain Internet and Communication technology which include web browsers, email, FAX and mobile communication. **2.** Understand basics of HTML, tags and structure of HTML documents. **3.** Basic concepts of E-commerce like classification by nature of transaction, non and intra business E-commerce and limitations and future of E-commerce. **4.** Understand the effect of ICT on employment, reliability of content available, security of data transfer on internet and computer viruses and antivirus software.

Course Outcomes B.Sc. Microbiology

Semester-5

Course	Outcome After successful completion of the course a student will be able to:
US05CMIC21 Molecular Genetics (Credit-4)	The course is structured with the aim to full fill the objective of introducing basic concepts of molecular biology to the under graduate students of Microbiology. Understand the importance of the master molecule "nucleic acid", get knowledge of DNA and RNA structures, genome organization of prokaryotes, gene structure and function. 1. Understand about mechanism of prokaryotic DNA replication and machinery of DNA replication. 2. Get knowledge regarding Central Dogma of gene expression and all step of the central dogma in detail like, transcription, translation , replication and reverse transcription. Know about regulation of gene expression 3. Understand about various RNAs, Ribosome, genetic code and their role in protein synthesis. 4. Learn about Protein modifications and secretion occurs in bacteria. 5. Understand how mutations and repair of genetic material influence evolutionary process. And will get information regarding chemical and physical mutagenic agents, types of mutations and DNA repair.
US05CMIC22 Microbial Metabolism (Credit-4)	1. Conceptualize their understanding of Microbial Metabolism 2. Understand the Principle of Thermodynamics. 3. Able to describe the structure, role and different modes of ATP generation in bacteria. 4. Explain transport systems of nutrient & proteins across the bacterial membrane 5. Gain knowledge of enzymes, enzyme kinetics and their regulation. 6.Understand the pathways for degradation and biosynthesis of carbohydrate, lipid & proteins and also biosynthesis of peptidoglycan.
US05CMIC23 Virology and Mycology	1. Understand the characteristics and importance of the viruses. 2. Understand life cycles of virulent and temperate bacteriophages and will be introduced to single stranded DNA containing phages like Ø X-174, Fd, RNA phages like, Ø6 of *Ps syringae* and MS2, QB.

(Credit-4)	3. Know about viruses of animals, plants, fungi, insects and other forms of life. What are the interactions of viruses with various hosts? How 4.Viruses cause cancer. (oncogenic viruses). To know the impact of Viruses on Human life by understanding how they cause diseases, how they influence various Industries and can be exploited in biological control. 5. Understand about general characters, classification, Nutrition and reproduction in fungi, the most exploited eukaryotic microbe. 6. Know about symbiosis, mycorrhiza, Homothallic and Heterothalism. 7. Understand Significance of Fungi by knowing their economic Importance, involvement in Secondary metabolites production, capacity of various kind of mycootoxin production, sex hormones production. 8. Apart from economic significance, students will be able to know about airborne and opportunistic human Diseases caused by fungi (Mycoses) and various fungal pathogens. 9. Learn that how these viruses and fungi offer the potential to range in severity from the harmless to the downright system crippling and can implement knowledge in management of our resources.
US05CMIC24 Fermentation Technology - I (Credit-4)	1. Recognize the potential of microorganisms which can produce variety of economically viable products. 2. Learn how microorganisms can be screened for production of various metabolites. 3. Understand how inoculums for the industrial fermentations can be prepared and maintained. 4. Appreciate the requirement of aseptic conditions and control of contaminations during the bioprocess. 5. Identify and select appropriate media constituent required to produce the desire product. 6. Understand on what basis cultivation methods are decided for a particular bioprocess. 7. Know the types of bioreactor configurations available for bioprocesses and will also be able to learn importance of various important components which constitute various parts of bioreactor. 8. Understand the need for monitoring and control of various essential bioprocess parameters

	9. Learn various methods available for recovery and purification of fermentation products from the complex fermentation broth.
US05CMIC25 (Microbiology Practical) (Credit-6)	1. In the laboratory course, the student gets an opportunity to perform experiments. 2. Has acquired practical skills of screening the microorganisms producing organic acids, enzymes, antibiotics, and growth factors. 3. Demonstrating principles of operation and functions of colorimeter, spectrophotometer and use of these instruments in the estimation of sugars, proteins etc. 4. Has acquired practical skills of measuring activity of enzyme. 5. Use of separation methods for biomolecules like sugars, proteins etc. 6. Are able to perform basic experiments to grow and study mutants in the laboratory.
US05DMIC27 Microbial Diversity and Ecology (Discipline Specific Elective) (Credit-2)	1. Learn about structure and component of ecosystem. 2. Get knowledge regarding extreme environment 3. Understand characteristics of fungal division & human immuno deficiency virus. 4. Conceptualize their knowledge regarding bacterial diversity.

Course Outcomes B.Sc. Microbiology

Semester-6

Course	**Outcome** After successful completion of the course a student will be able to:
US06CMIC21 Molecular Biology (Credit-4)	1. Developed understanding of recombination of bacteria. Understood about the three well known mechanisms by which the genetic material is transferred among the microorganisms namely transformation transduction and conjugation. **2.** Are able to describe different types of plasmids and understand the consequences of recombination. **3.** Develop, understand and apply tools and techniques involved in Genetic engineering.

	4. Understand the basic steps involved in gene cloning and its applications.
US06CMIC22 Immunology and Medical Microbiology (Credit-4)	1. Conceptualize their understanding of host defense mechanism 2. Understanding of Antigens & Antibody 3. Understand the structure of immunoglobulin and antigen-antibody reaction. 4. Explain the importance of normal flora of human body 5. Understand the importance of pathogencity and virulence. 6. Understand importance of human diseases.
US06CMIC23 Agricultural and Environmental Microbiology (Credit-4)	1. Learn about nitrogen cycle, types of nitrogen fixation and significance of nitrogen fixation in the soil. 2. Know about bio fertilizers & their advantages in agriculture 3. Get knowledge regarding interactions between plants and microbes 4. Learn various types of bioremediation, how to improve bioremediation using microbes and biodegradation of environmental pollutants. 5. Understand about biofuels as energy sources. 6. Gain knowledge regarding global environmental problems.
US06CMIC24 Fermentation Technology- II (Credit-4)	1. Learn various strategies through which natural isolates can be transformed in to a hyper producing strain with respect to desired product**.** 2. Learn various methods related to the biological assay of various products at different stage of their fermentative production. 3. Recognize the importance of Good Manufacturing Practice at the various stages of fermentative production and before releasing the product in to the market which type of quality checks are essential. 4. Sensitize for various safety levels which are required to be considered during the fermentative production. 5. Learn how by using technologies like immobilization, efficiency of bioprocesses can be increased. 6. Appreciate the economic considerations involved in bioprocess industry. 7. Know about the generation of industrial waste water, parameters to be

	monitored and learn various methods to treat such effluent in order to reduce its toxicity. 8. Learn detailed fermentative production of some typical Primary and secondary metabolites to get the panoramic view of entire fermentation process.
US06CMIC25 **(Microbiology Practical)** **(Credit-6)**	1. Has acquired practical skills of handing microorganisms in the laboratory for study. 2. Perform basic laboratory experiments to isolate and identify bacteria, and methods to preserve bacteria in the laboratory. 3. Has acquired practical skills of estimating blood sugar, protein, cholesterol, urea etc. 4. Has acquired knowledge of composition of blood and practical skills of counting blood cells like WBC's. 5. Has acquired practical skills of blood grouping.
US06DMIC26 **Applied Medical Technolgy and Clinical Management** **(Discipline Specific Elective)** **(Credit-2)**	1. Conceptualize their understanding of blood cells & blood group System. 2. Understand various techniques of clinical microbiology. 3. Understand the clinical test in biochemistry. 4. Understand importance of healthcare and biomedical waste management.

Petlad Education Trust Managed

Shri R. K. Parikh Arts and Science College, Petlad

Accredited by NAAC B+ Grade (2017-2022)

DEPARTMENT OF BIOLOGY

B. Sc. BOTANY

Program Outcomes, Program Specific Outcomes and Course Outcomes

The student graduating with the Degree B. Sc. Botany should be able to acquire

Program Outcomes (PO)	**1.** a fundamental and systematic understanding of the academic field of Biology, its different learning areas and applications in basic biology like Classifications of plants and animals, morphology, systematics, Cytology, Genetics, Environmental biology, etc **2.** Developed the ability to use skills in Biology and its related areas of technology such as solving the problems related to Genetics and heredity. Develops skills in molecular biology, biotechnology, plant and animal tissue culture and bioinformatics. **3.** Developed skills to identify the problems of biodiversity and solve them using scientific approach. Recognize the importance of Biodiversity and its components in human welfare. **4.** Able to identify the plant and animal species with their morphological, anatomical, physiological and/or molecular characteristics. **5.** Able to create database using the bioinformatics tools for better understanding the nature of biological organisms. **6.** Demonstrate professional behaviour such as (i) being objective, unbiased and truthful in all aspects of work and avoiding unethical, irrational behaviour such as fabricating, falsifying or misrepresenting data or committing plagiarism; (ii)the ability to identify the potential ethical issues in work-related situations; (iii) appreciation of intellectual property, environmental and sustainability issues; and (iv) promoting safe learning and working environment.

Program Specific Outcomes (POS)	**1.** Understand the core concept of Biology subjects. **2.** Acquire analytical and logical skill for higher Education. **3.** Excel in Experimental and Theoretical Biology. **4.** Trained to take up jobs in allied fields. **5.** Confident to take up competitive exams
Course Outcomes B. Sc. Biology **Semester-1**	
Course	**Outcome** After completion these courses students should be able to
US01CBIO21 CELL BIOLOGY AND BIODIVERSITY (credit-4)	Understand the cell as a structural and functional unit of life. **1.** Explore the significance of Cell cycle and cell divisions. **2.** Know the structure of Chromosome and their types. **3.** Acquire the knowledge about various biomolecules such as Carbohydrates, Lipids, Proteins and Nucleic acids. **4.** Explore the scale of biodiversity life forms ranging from prokaryotic to eukaryotic; simple to complex viz. Viruses and bacteria to Gymnosperms with their type examples. **5.** General account of Invertebrates is studied for various parameters such as its nutrition methods, pathogenicity, economic importance and social life of various phylum with its examples.
US01CBIO22 (Biology Practical) (credit-2)	In the laboratory course, the student shall perform experiments related to **1.** Qualitative tests for biomolecules. **2.** Study the life cycle ranging from lower to higher group of plants for its vegetative morphology, anatomy and reproductive structure through observation and dissection. **3.** Study of invertebrate animals through examine the specimens of each life forms, and **4.** Carried out field visits for understanding biodiversity.
US01SENV21 Environmental studies (Skill enhancement Elective course) (credit-2)	In the skill enhancement course, the student learn about **1.** Basic definitions, scopes and importance of environmental studies. **2.** The ecosystems and its components, food web and energy flow. **3.** Various types of ecosystems. **4.** Renewable and non-renewable natural resources and its conservation strategies. **5.** Various biotic inter-relationships.
Course Outcomes B. Sc. Biology **Semester-2**	
Course	**Outcome** After completion these courses students should be able to
US02CBIO21	**1.** Understand the principles of Inheritance and variation.

Genetics, Tissue culture and General Biology (Credit-4)	2. Learn about historical perspective, important terms, basic requirements, and basic steps for Tissue culture techniques. Significance of TC applications. 3. Know the basics of plant morphology to understand the plant systematics and study of some plant families of angiosperm origin. 4. Study the general account of Chordates, parental care in amphibians, and fishes, migrations and flight adaptations in birds, and evolution history of man.
US02CBIO22 (Biology Practical) (credit-2)	In the laboratory course, the student shall perform experiments related to 1. Pedigree analysis and numerical based on Mendalian genetics. 2. Perform the analysis of blood grouping through experiments. 3. Study of plant morphology and families, 4. Identifications of poisonous and non-poisonous snakes, feathers of birds etc.
US02SENV21 Environmental studies (Skill enhancement Elective course) (credit-2)	In the skill enhancement course, the student learn about 1. Environmental pollution. 2. Nuclear hazards and human health risk 3. Solid waste management 4. Environmental issues such as climate change, global warming etc and environmental policies. 5. Environmental awareness and disaster managements 6. Wildlife management and animal biodiversity of Gujarat.
Course Outcomes B. Sc. Botany **Semester-3**	
Course	**Outcome** After completion these courses students should be able to
US03CBOT21 Phycology, Mycology and Plant pathology (Credit-4)	1. Learn about the General characteristics of Cyanophyta, Xanthophyta, Chlorophyta, Charophyta, Phaeophyta and Rhodophyta with the one or more examples of life forms for each. 2. Explore the Role of algae in the environment, agriculture, biotechnology and industry. 3. Learn about the General Characteristic features of Chytridiomycota, Oomycota, Zygomycota, Ascomycota, Basidiomycota with their type study. 4. Study the symbiotic association and applied mycology. 5. Study the major plant diseases and its significance.
US03CBOT22 Plant anatomy, Physiology, Taxonomy and Bioinformatics (credit-4)	Learn about 1. Tissue organization and its functional aspects. 2. Physiological behaviour and its expression. 3. Biological Concept of species and some systematics of plant families. 4. Introductory Bioinformatics and its databases.

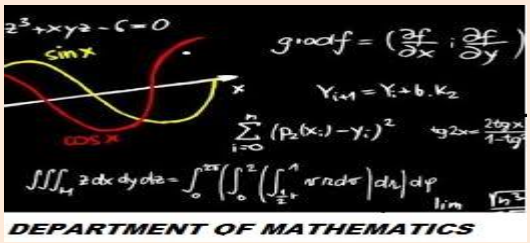
US03CBOT23 (Practical) (credit-2)	In the laboratory course, student will 1. Gain hands-on experience of using various optical instruments and making temporary mountings. 2. Identifying various pathogens for plant diseases. 3. Study the characteristics of algae, fungi and lichens. 4. Study the characteristics of some selected plant families and their economic role through specimens/charts/field specimens. 5. Carried out field visits to explore ecological understanding and learn range of biodiversity.
US03SICT21 Information and Communication Technology – I (Skill Enhancement Elective Course) (Credit-2)	1. Describe basics of computer system including components of general purpose computer system, generations of computer languages and various operating systems. 2. Explain the input and output devices. 3. Describe the storage devices like hard disk, CD, DVD, pen drive, memory cards and its advantages and disadvantages. 4. Explain different types of networks like LAN, MAN, WAN and network topology.
Course Outcomes B. Sc. Botany **Semester-4**	
Course	**Outcome** After completion these courses students should be able to
US04CBOT21 Archegoniate, Economic and Nutraceutical Botany (Credit-4)	Learn about 1. Unifying features of archegoniate, General characteristics of Bryophytes, Pteridophyte and Gymnosperms. 2. They also study the type study specimen from each group such as *Marchantia, Pellia, Anthoceros, Funaria, Psilotum, Selaginella, Marsilea, Pinus* and *Gnetum*. 3. Study the economic importance of major crops. 4. Brief idea about some Nutraceutical rich supplements, with applications of Nutraceutical in daily life.
US04CBOT22 Plant Anatomy, Embryology, Tissue Culture and basic Molecular Biology (credit-4)	Learn about 1. Plant's internal organization and secondary growth. 2. Plant embryology and its significance. 3. Plant biotechnology and its application. 4. Basic molecular biology and its central dogma.
US04CBOT23 (Practical) (credit-2)	In the laboratory, student carryout experiments to understand 1. The life cycle of bryophytes, pteridophytes and gymnosperms. 2. Internal organization of plants such as types of stomata, nectary, laticifers, lenticels, cambium and secondary growth. 3. Various embryological parameters through experiments and models/slides/charts. 4. Histochemical studies through analytical experiments.

	5. Preparation study for molecular studies.
US04SICT21 Information and Communication Technology – II (Skill Enhancement Elective Course) (Credit-2)	1. Explain Internet and Communication technology which include web browsers, email, FAX and mobile communication. 2. Understand basics of HTML, tags and structure of HTML documents. 3. Basic concepts of E-commerce like classification by nature of transaction, non and intra business E-commerce and limitations and future of E-commerce. 4. Understand the effect of ICT on employment, reliability of content available, security of data transfer on internet and computer viruses and antivirus software.

Petlad Education Trust Managed

Shri R. K. Parikh Arts and Science College, Petlad

Accredited by NAAC B+ Grade (2017-2022)



MATHEMATICS DEPARTMENT

Program Outcomes, Program Specific Outcomes and Course Outcomes

After successful completion of two year programme in Mathematics a student should be able to acquire:

Program Outcomes (PO)	**1.** Mathematics is the study and investigation of structure, quantity, and space. Demonstrate educational skills in areas of Calculus, Algebra, Numerical methods, Multivariate calculus, Ordinary differential equations and Partial differential equations. **2.** Demonstrate the ability to use skills in Mathematics: a. Students will be able to productively discuss mathematics in a group setting. b. Students will be able to generate solutions to unfamiliar problems. c. The student will understand and appreciate the applicability of calculations to nature, business, science and etc. **3.** This course builds up a comprehension of analytical skills and purposeful abilities and competencies in Mathematics. The program deals with the knowledge of fundamental applications of mathematical strategies that are applied to general concepts outside the extent of theoretical mathematics. **4.** Equip the students with skills to analyze problems, formulate a hypothesis, and draw reasonable results thereof. Develop broad and balanced knowledge and understanding of definitions, concepts, principles and theorems.

	5. Enhance the ability of learns to apply the knowledge and skills acquired by them during the practical sessions. Provide knowledge of a wide range of mathematical techniques and applications in other scientific and engineering domains. **6.** Understand mathematical ideas from basic axioms prepare and motivate students for research studies in mathematics and related fields.
Program Specific Outcomes (POS)	**1.** Understand, formulate and use quantitative models arising in Social science, business and other contexts. **2.** Students are able to think in critical manner. Know when there is need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue at hand. **3.** Provide students sufficient knowledge and skills enabling them to undertake further studies in mathematics and its allied areas on multiple disciplines concerned with mathematics. **4.** Encourage the students to develop a range of generic skills helpful in employment, internships and social activities. **5.** Self-assured to engage in competitive exams e.g. NET, GATE,etc.
Course Outcomes Mathematics **Semester-1**	
Course	**Outcome** After studying these courses students should be able to:
US01CMTH21 Calculus (credit-4)	**1.** Calculate the higher order derivatives of algebraic and trigonometric functions. **2.** Use Leibnitz's theorem to find the higher order derivatives of product functions. **3.** Understand the idea of limit by using L 'Hospital's rule. Find angle between two curves. **4.** Sketch Cartesian curves, Parametric curves, Polar curves, and its reciprocal curves. (a) Recognize when level set and graph-of- function formulae are quadric surfaces. (b) Recognize and plot families of quadric curves in the plane.

	(c) Recognize symmetry properties of quadric surfaces, including rotational, scaling, and axes-swapping symmetries and apply in problem solving. **5.** Apply the concept and principles of differential and integral calculus to solve geometric and physical problems. Application of integration to obtain reduction formulae of trigonometric functions. **6.** Describe the concepts of curvature, evolutes and envelops of certain curves. Informally explain concept of limit of the function. Understand homogeneous function and prove Eulers' theorem along useful corollaries. Learn application of Eulers' theorem for two and three variables.
US01CMTH22 (Practical) (credit-2)	In the practical session of mathematics will be devoted to problem solving practices. It is conducted in a fashion very similar to lectures. ➢ Understand the ideas of develop skill in performing higher order derivatives and its application. ➢ Most appropriate application of Leibniz's theorem. ➢ Gain knowledge of sketching the variety of curves with its significant properties. ➢ Application of Euler's theorem on homogeneous equation.

Course Outcomes Mathematics

Semester-2

Course	**Outcome** After completion these courses students should be able to
US02CMTH21 Algebra (Credit-4)	**1.** Develop skills for solving equations. Learn about the basics of complex number system. Define the concept of differentiation of complex function. **2.** Learns De'movies theorem and its application in finding out n^{th} root of complex numbers. Implement different methods to find complex roots. **3.** Distinguish the types of matrices in details. Perform algebraic operations on matrices. Reverse laws (for product), Distribution laws, and associative laws. **4.** Prove theorems a unique representation of square matrices in terms of symmetric and skew-symmetric as well as Hermitian and skew-Hermitian matrices and apply them to given matrix for such representations. **5.** Understands and learns Cycle-Hamilton theorem and verify it for a given square matrix.

	6. Define and find characteristic roots of and corresponding vector of a square matrix. Construct an Orthogonal and Unitary matrix with the help of a real skew symmetric matrix.
US02CMTH22 (Practical) (credit-2)	In the practical session of mathematics will be devoted to problem solving practices. • Learn about algebra of complex number and its applications. • Develop skill to do work out of matrices with their standard domain by using number of applications. • Build up their awareness towards solving matrices with its pattern. • Application of Cycle-Hamilton theorem for square matrix. In addition, to find Eigen values and corresponding vectors.
Course Outcomes Mathematics **Semester-3**	
Course	**Outcome** After completion these courses students should be able to
US03CMTH21 Numerical Methods (Credit-4)	**1.** Understands the concepts of finite difference. **2.** Gains knowledge about to interpolation for equal intervals as well as un-equal intervals. **3.** Identifies numerical differentiation. **4.** Evaluate numerical integration with different methods. **5.** Understands the concept of numerical differential equations. **6.** Distinguish methods of Taylor series, Euler's method, Modified Euler's method and Runge-Kutta method's to find solutions of differential equations. **7.** Estimates the numerical solutions of first order differential equations.
US03CMTH22 Multivariate Calculus (credit-4)	**1.** Learn that calculus serves as a basic for advance mathematics. **2.** Discriminate proper and improper integrations and evaluate Beta and Gama functions. Analyze Beta and Gama functions and their properties. **3.** Defines line integral, surface integral, and volume integral. Compute length, area, and volume of surface using vector integral. **4.** Memorize definition of gradient and directional derivative of scalar field, divergence and curl of a vector field. Prove important results of divergence and curve of a vector field. Find tangent and normal plane to surface.

	5. Memorize Green's theorem, and make sketch illustrating it. Explain how Green's theorem is generalization of the fundamental theorem of calculus. Recognize the statement of Stock's theorem and the divergence theorem. Be aware of applications of these theorems in Physical and Mechanical Engineering.
US03CMTH23 (Practical) (credit-4)	PART-I (Problems and Exercises in Numerical Methods) 1. Understands the practical aspects of the Numerical analysis. 2. Proficient in implementing numerical methods for a variety of multidisciplinary applications. 3. Understand of common numerical analysis and how they are used to obtain approximate solutions to otherwise intractable mathematical problems. PART-II (Problems and Exercises in Multivariate Calculus) 1. Ability to provide new solutions using the domain knowledge of Calculus. 2. Appreciate how abstract ideas and rigorous methods in calculus can be applied to important practical problems.

Course Outcomes Mathematics

Semester-4

Course	**Outcome** After completion these courses students should be able to
US04CMTH21 Ordinary Differential Equations (Credit-4)	1. Student will be able to solve first order differential equation utilizing the standard techniques for Separable, Exact, Linear, Homogeneous etc. 2. Student will be able to find the complete solution of a non-homogeneous differential equation as a linear combination of the complementary function and particular solution. 3. Student will have a working knowledge of basic application problems described by higher order linear differential equations: (1) Constant Coefficient (2) Variable Coefficient 4. Identify and obtain the solution of Clairaut's equation (First order and Higher degree) 5. Student will be introduced to concept the Laplace's transform and application of it in the solution of constant coefficient linear ordinary differential equation.
US04CMTH22 Partial Differential Equations	1. Solve linear partial differential equation of both first and second order. 2. Familiarize with the various techniques of finding the solution of partial differential equation. 3. Identify real phenomena as models of partial differential equation.

(credit-4)	**4.** Can apply theorems which guarantee convergence of series of functions in various norms **5.** Be competent in solving linear partial differential equation using classical solution methods like: Charpit's method, Jacobi's method.
US04CMTH23 (Practical) (credit-4)	PART-I (Problems and Exercises in Ordinary Differential Equations) **1.** Student will be able to find the complete solution of a differential equation with constant as well as variable coefficient by variation of parameters. **2.** Student will work with a variety of applications using appropriate models and will analyze the validity of the solutions obtained. PART-I I(Problems and Exercises in Partial Differential Equations) **1.** Students will under the practical use of Partial differential Equation with its applications. **2.** Students will have developed analytical skill and problem solving strategies to solve various type of problems.

Petlad Education Trust Managed

Shri R. K. Parikh Arts and Science College, Petlad

Accredited by NAAC B+ Grade (2017-2022)

ECONOMICS DEPARTMENT

B.A. Economics

Program Outcomes, Program Specific Outcomes and Course Outcomes

The student graduating with the Degree B.A. Economics should be able to acquire

Program Outcomes (PO)	1. A fundamental and systematic understanding of the academic field of Economics. Paper is to introduce the basic concepts of Economics to the students. Student seeking admission for B.A. Economics programme are expected to imbue with following quality which help them in their future life to achieve the expected goals. 2. To make students aware about socio-cultural and economic aspects of our economy. To improve their understanding of various theories on problems and their solutions 3. To introduce the students to basic understanding of micro and macro Economics and International economics and public finance. paper also enhance the understanding of conceptual terminology of Economics 4. Paper enable them for further learning in Economics. makes them more aware about the concept of Economics 5. The motive of subject is to enhance the analytical skills of economic behaviour of individual, Firm and Market. 6. All the concepts in this syllabus concerned with primitive concepts which is mainly concerned with U.G. Student of Economics. 7. The main objective of the all paper is to make the students familiar with the problems and characteristic of different sectors of Indian economy.
Program Specific Outcomes (POS)	1. The student understands the basic concepts in Economics and can apply them in the real world. He/she is also updated with the recent

	trends in the subject. The student also builds a sound base for various post graduate courses in Economics and related fields. **2.** Understanding how different degrees of competition in a market affect pricing and output. **3.** Understanding the efficiency and equity implications of market interference, including government policy. Developing research knowledge in economics. Developing the skill of data collection & use of sampling techniques in research. Developing the knowledge about theories of economic growth & Development and issues of economic planning. Creating awareness about changing macro-economic policies and theories. **4.** Understand the core concept of Economics subjects. Acquire analytical and logical skill for higher Education. Excel in Economic problems, policy and Implication Economic theory. Trained to take up jobs in allied fields. Confident to take up competitive exams
Course Outcomes B.A. Economics **Semester-1**	
Course	**Outcome** After completion these courses students should be able to
UA01CECO21 **Introductory Micro Economics** (credit-3)	1. Learning and application of elementary concepts of micro economics in the real world. Definition, basic concepts. 2. This paper is to introduce the basic concepts demand and supply, factor of production and various concept of income and cost and the market type of economics to the students. 3. This paper enable them for further learning in economics subject.
UA01CECO22 Economic Systems (credit-3)	1. The course also aims to introduce the deferent economic system in world. Basic concepts of economic systems and its basic feature 2 The course also aims to introduce the merit and demerits of different economic systems.
Course Outcomes B.A. Economics **Semester-2**	

Course	Outcome After completion these courses students should be able to
UA02CECO21 Introductory Macro Economics (Credit-3)	1. Identifying the basic concepts and theories of macro economics. 2. Awareness about changing macro economics theories and policies. 3. Understanding various concepts such as GDP, GNP, NNP, NDP. 4. Understanding to students money, inflation, policy matter and banking systems.
UA02CECO22 Indian Economic Problems (credit-3)	1. The course also aims to introduce the developed and developing economy, major issues of development in indian economy. 2. Understanding to students population scenario in india. 3. Poverty, unemployment and role of agriculture sector in economy.
Course Outcomes B.A. Economics Semester-3	
Course	
UA03CECO21 Money and Banking (Credit-3)	1. The main objective of this paper is to introduce the students to basic understanding of meaning and functions of money, type of bank and banking systems. 2. The students get information regarding money, Inflation and commercial Banking.
UA03CECO22 **Human Development** (Credit-3)	1. Identify the evolution of Human Resource Development. 2. Write down the Education and Economic Development. 3. Describe the Man power planning. 4. Understand the Training and Developing Human Resource. 5. Describe the Women Entrepreneur
UA03CECO23 Micro Economics (Credit-3)	1. Knowing the decision making of consumer, identifying the nature of revenue and cost of production, comprehending the demand function and production function. 2. Clarifying the meaning of marginal, average, total revenue and cost. 3. Awareness of different markts structure, Understanding pricing in different markets and judging the factor pricing.
Course Outcomes B.A. Economics Semester-4	
Course	**Outcome** After completion these courses students should be able to

UA04CECO21 Indian Economy (Credit-3)	1. Building awareness and knowledge about the problems and policies of the Indian economy as also current trends. 2. The syllabus to students understanding characteristics features , structural changes in Indian economy. 3. Comprehension of the nature and impact of new economic reforms on the economy. Knowing the problems of unemployment, poverty, rising economic and social inequality and problems of regional imbalances in India. 4. Evaluating the changing role of agriculture, industry and service sectore, foreign sector in economy. Measuring the problems and prospects of cottge and small scale industries and its sicknesses.
UA04CECO22 Industrial Economics (Credit-3)	1. Industrial Economics also gives insights into how firms organise their activities, as well as considering their motivation. 2. In many micro courses, profit maximisation is taken as given, but many industrial economics courses examine alternative objectives, such as trying to grow market share.
UA04CECO23 Macro Economics (Credit-3)	1. Understanding various concepts such as Personal Income, Disposable Income, Per Capita Income, and National Income. 2. Identifying the factors determining gross domestic product, employment, the general level of prices, and interest rates. 3. Realizing the law of markets, consumption function and investment function. Judging the role of fiscal policy and monetary policy in a Developing economy. 4. Knowing features, phases and theories of trade cycles. • Evaluating types, merits and demerits of taxes. •
Course Outcomes B.A. Economics Semester-5	
Course	
UA05CECO21 Micro Economics Credit -3	1. Write down the classification of market cost and revenue Analysis 2. Understand the classification of market –Perfect competition, monopoly and monopolistic competition 3. Describe the Price and Output determination of price (Firms and Industry) 4. Understand the theories of factor pricing
UA05CECO22 International trede Credit-3	1. Elaborating the importance of the study of International Economics. Classical and modern Trade and trade theory 2. Finding similarities and dissimilarities in inter-regional and international trade. 3. Knowing the changes in the import-export policies of India. Evaluating various types of exchange rates and its merits and demerits.

UA05CECO23 **Economics of entrepreneurship** **Credit-3**	1. Understanding basic concepts in the area of entrepreneurship, 2. Understanding the role and importance of entrepreneurship for economic development, 3. developing personal creativity and entrepreneurial initiative, adopting of the key steps in the elaboration of business idea, 4. Understanding the stages of the entrepreneurial process and the resources needed for the successful development of entrepreneurial ventures. 5. Analyse the business environment in order to identify business opportunities Identify the elements of success of entrepreneurial ventures, 6. Write down the role and process of Entrepreneurial Development Understand the institutional support to entrepreneurs •
UA05CECO24 **History of Economic thought** **Credit-3**	1. Acquaintance with the economic thoughts of Classical, Nationalist and Socialist Thinkers. 2. Judging the development of economic thoughts. 3. Know to students Ideologies of Physiocracy, Mercantilism and Population theory of Malthus.
UA05CECO25 **Managerial Economics** **Credi5-3**	1. Understand the roles of managers in firms. 2. Understand the internal and external decisions to be made by managers. 3. Analyze the demand and supply conditions and assess the position of a company. 4. Design competition strategies, including costing, pricing, product differentiation, and market environment according to the natures of products and the structures of the markets. 5. Analyze real-world business problems with a systematic theoretical framework. Make optimal business decisions by integrating the concepts of economics.
UA05CECO26 **Survey method** **Credit-3**	1. Each degree program in economics contains a core group of theory courses, a series of quantitative skills course and field specialization courses that involve the application of economic theory. 2. Each degree program quantitative analysis to major areas of study within the discipline 3. Identify and define basic statistics techniques which are needed for studying in Economics and education the educational data. Primary and secondary Data collections. Data interpretation and data analysis 4. Outline the distinct method of using raw data in the form of frequency distribution. Apply knowledge of statistical measures such as Mean, Median and Mode for analysis and interpretation of data. 5. Analyze the different measures of dispersion that are useful in the field of Economics.

	6. Develop skills and knowledge to apply educational data through graphs for analyzing different descriptive measures.
Course Outcomes B.A. Economics **Semester-6**	
UA06CECO21 **Macro Economics** **(Credit-3)**	1. Understand the theories of Employment. Describe the consumption function, Psychological law of consumption 2. Write down the working of monetary and fiscal policy in a developing countries 3. Understand the classification of employment theory of classical neo classical view. 4. Understand the theories of factor pricing 5. Describe the classical and Keynesian stabilization theories 6. Understand the theories of Inflation, multiplier and investment
UA06CECO22 **International trade** **(Credit-3)**	1. Discussing the types and effects of tariffs and quotas. 2. Judging the function, merits and demerits of Foreign Capital, and International Corporation (IMF, IBRD, WTO and SAARC). 3. Realizing the volume, composition and direction of Balance of trade and Balance of payments.
UA06CECO23 **Public Economics** **(Credit-3)**	**1.** Public economics is the study of government policy from the points of view of economic efficiency and equity. The paper deals with the nature of government intervention and its implications for allocation, distribution and stabilization. Inherently, this study involves a formal analysis of government taxation and expenditures. **2.** The subject encompasses a host of topics including public goods, market failures and externalities. The paper is divided into two sections, one dealing with the theory of public economics and the other with the Indian public finances.
UA06CECO24 **History of economic thought –II** **(Credit-3)**	**1.** Realizing the economic concepts and theories of Neo-classical and Indian thinkers. **2.** Mercantilism and thoughts Evaluating the development and Indian economic thoughts. **3.** Wives demographic theory of Malthus and optimum population theory.
UA06CECO25 **Agriculture Economics** **(Credit-3)**	**1.** Sensitize the overall development and engine of growth in agriculture. Draw distinctive features of rural and urban economy or agricultural and non-agricultural which can influence the whole economy. **2.** Learn and identify the opportunities open/available in those flourishing sectors such as horticulture, fishing and floriculture

	and forestry. Find new investment opportunities to add income and employment. **3.** Understand limited resources available in the economy. Realize the need to exploit and utilize through development and improvement of production techniques. **4.** Make them aware of the availability of rich natural endowments to achieve sustainable agricultural development. With this knowledge they can challenge the problems of unemployment, inequality, shortage of food productions, poverty, and be useful to compete advanced agricultural economies. **5.** Gain knowledge of the causes of regional variations in productivity and production, social and economic inequality, size of land holdings and lack of quality inputs etc. and suggest appropriate measures for the whole economy
UA06CECO26 **Development and Enviromental Economics** **(Credit-3)**	**1.** Realize the importance and influence of environment on the economy including the quality of manpower. Arouse their feelings to make cleaner environment so as to achieve harmonious development. **2.** Understand that environmental problem is not the problem of a single country or region but a global problem/issue. Hence, policy formulation may be for all countries. Demonstrate the scientific management of waste materials; realize the role and importance of individuals to keep the environment clean. **3.** Understand the causes and victims of environmental pollution like poverty, population explosion, and over-use of resources, careless or unscientific dump/management of wastes. Suggest appropriate measures to correct environmental degradation, aware of those ingredients such as healthy climate, quality of human beings, domestic and other natural habitats and biodiversity levels, productivity and productions, sustainability, etc. are all influenced by environment.