2021-2022

Course Outcomes (COs) : All Courses

Supplementary Copy (Special / TY Level)

Rayat Shikshan Sanstha's

DADA PATIL MAHAVIDYALAYA, KARJAT .

SCIENCE FACULTY

1.PHYSICS

Salient Features of Revised Syllabi in Physics:

As far as possible to promote:

1) Physics Education through Master Texts:

It helps in understanding the theoretical and mathematical development of the subject and to create interest in the subject.

2) Physics Education through Experimentation:

It helps in general to improve scientific attitude. So emphasis is given on the development of experimental skills, data analysis, calculations, and also on the limitations of the experimental method and data and, results obtained.

3) Physics Education through Problem Solving: It helps in understanding the concepts of physics. It underline the strength of equations, formulae, graphs, mathematical tools to tackle the problems. So accordingly, we have introduced compulsory problem part in the question paper.

4) Physics Education through History and Philosophy:

It helps in understanding the conceptual development of the subject and thereby increase the interest in the subject. A topic on this is introduced in the Physics Course.

5) Physics Education through Awareness of Misconceptions:

It improves the scientific awareness among the students. A discussion on different subjects are encouraged.

6) Physics Education through Proto-research:

It creates interest in the subject and improves technological aspect. Accordingly, mini projects, hands-on activities, projects, models and demonstrations etc. is included in the syllabi.

7) Physics Education through Qualitative Overview:

It creates interest in the subject to continue to work in the field of science in general and physics in particular. Accordingly future directions and frontiers of the subject are included in the syllabi.

PHY-3510 SEC (I): ENERGY STUDIES:

Course Objectives:

1. Students understand the comparative aspects, advantages and disadvantages of various sources of energy. They understand the facts and myths regarding the energy sources.
2. Students learn the basic principles involved and technologies developed in the uses of solar energy, biomass energy, wind energy, fuel cells.
3. Students understand the challenges and opportunities in conversion of energy from one form to another, generation of electricity and mechanical work using different energy sources.
4. Students get acquainted with challenges and recent trends in energy storage devices and they learn more about super-capacitors and batteries, electrical vehicles. They can imagine about future road maps in the fields of energy conversion and storage technologies.

Course Outcomes:

1. Students become capable of conducting energy audits and give consultancy in that field.
2. Students can design different types of solar heaters for small domestic as well as large scale community level applications.
3. Students acquire skills to implement solar P-V systems at domestic levels as well as for office premises and educational institutions. Students become able to start their own enterprise in net metering.
4. Students get ideas and hence become self-employed in the field of design , production, commissioning and implementation of bio-mass energy sources , bio-gas plants, gasifiers, wind mills, hybrid systems etc.
5. Students can go for research in the fields of super-capacitors, battery technologies, fuel cells and material synthesis for implementation of these technologies.
6. Students become successful entrepreneurs in the energy field.

Students strive to make the regions where they live and work self-sufficient in generating and fulfilling their own energy needs using different energy solutions.

PHY-3510 SEC (J): INTRODUCTION TO ARDUINO:

Objectives:

1. To create general awareness and interest in Arduino Boards.
2. To provide knowledge of different Arduino boards and various sensors and actuators.
3. The course enables student to understand the basics of interfacing with Arduino Boards.
4. To familiarize students with Arduino as IDE, programming language & platform and to Program basic Arduino examples.
5. To provide knowledge of different Smart System applications.
6. Develop skills to design and implement various smart system application.

Course Outcomes: After successful completion of this course, student will be able to

1. Students will be able to understand and use various Arduino Boards, and its various components, Input / Output Pins, Input / Output Devices.
2. Understand general concepts of Programming Arduino Boards.
3. Apply the knowledge gain to design applications using Arduino in different domains.
4. To analyze and evaluate the performance of various Arduino based devices.
5. Learn and understand about any new IDE, compiler, and MCU chip in Arduino compatible boards or similar types.

PHY-3510 SEC (K): SMART SENSORS AND TRANSDUCER TECHNOLOGY:

Course Objectives:

1. To make students familiar with the constructions and working principle of different types of sensors and transducers.
2. To make students aware about the measuring instruments and the methods of measurement and the use of different transducers.

Course Outcomes: At the end of the course, a student will be able to:

 Use concepts in common methods for converting a physical parameter into an electrical quantity

 Classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light

 Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc

 Predict correctly the expected performance of various sensors

 Locate different type of sensors used in real life applications and paraphrase their importance

 Set up testing strategies to evaluate performance characteristics of different types of sensors and transducers and develop professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system.

PHY-3511 SEC (L): PHYSICS WORKSHOP SKILL:

Objectives:

This course is to get exposure with various aspects of instruments and their usage through hands-on mode.

Course outcomes:-

After completion of this course students will able to handle and test various instruments.

PHY-3511 SEC (M): BIOMEDICAL INSTRUMENTS

Objectives

1. Introduction to various bio-signals and their origin
2. Understanding of electrode theory
3. Use of transducers in biomedical instrumentation
4. Patient safety while using biomedical instrumentation
5. Instruments handling and analysis of the recorded data

Course Outcomes

 Students will acquire basic knowledge of biomedical instrumentation.

 Students can handle and operate different equipment's like ECG, Oxymeter, and Glucometer.

 Students will be able to record the different health parameters using it.

 Student will also able to analyze and interpret the recorded data.

PHY-3511 SEC (N): NONDESTRUCTIVE TESTING TECHNIQUES

Objective:

 To study and understand the various non-destructive testing (NDT) methods, and their industrial and scientific applications.

Outcomes:

 After completion of this course the students will be able to use NDT methods for defects and characterization of industrial components.

PHY-3511 SEC (O): ACOUSTICS APPLICATIONS

Objective:

To study and understand about sound physics, properties and their applications.

Outcomes:

After completion of this course the students will be able to use sound detection and characterization of sounds.

T.Y.B.Sc. (Physics) (Sem-VI)

PHY-3610 SEC (X): SOLAR PV SYSTEM: INSTALLATION, REPAIRING AND MAINTENANCE

Objectives:

1. In this skill oriented course, student will study basics of solar photovoltaic (PV) cells, modules, and system components.

2. Design and sizing of off-grid PV system for homes, apartments as well as commercial offices.

3. Understanding energy conversion from sunlight to electricity, and working with solar conversion equipment.

4. This Course will hands on experience needed to become self-employed.

Outcomes:

1. Learn basics of light conversion in electricity.
2. Hands on training will motivate to use Solar PV system.
3. Become entrepreneur / self-employed.
4. Analyzed of MSEB electricity bill and design and sizing of off-grid PV system
5. Participants will learn about solar PV module and batteries used in solar PV plant.

PHY-3610 SEC (Y): APPLICATIONS OF INTERNET OF THINGS (IOT)

Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the C# Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices

Learning Outcomes :

1. IOT concepts
2. IOT Standards
3. Components of IOT System.
4. Relevance of IOT for the future.
5. IOT Applications.
6. IOT for smart cities (Case study Smart city Barcelona)
7. IOT in Indian Scenario
8. Challenges in IOT implementation.

PHY-3610 SEC (Z): CALIBRATION TECHNIQUES

Objective:

- To make students familiar with the constructions and working principle of different types of Instruments
- To make students aware about the measuring instruments and Calibration of Instrument

Course Outcomes: At the end of the course, a student will be able to:

● Calibrate hydraulic, pneumatic and mechanical measuring and control equipment: setting, adjustment, validation or verification of mechanical, pneumatic, hydraulic, measuring and control instruments using reference standards in accordance with predetermined procedures.

● Calibrate electrical and electronic measuring and control equipment: setting, adjustment, validation or verification of electrical, electronic measuring and control instruments using reference standards in accordance with predetermined procedures.

● Carryout maintenance activities on instrumentation and control panel.

PHY-3611 SEC (AA): MICROCONTROLLER

Objective:

● To make students familiar with the constructions and working principle of microprocessor

● To make students aware about microprocessor

Outcome: After successful completion of this course students are supposed to develop their own applications/ mini/ tiny projects using microcontroller.

PHY-3611 SEC (AB): INSTRUMENTATION FOR AGRICULTURE

Objectives:

After completion of this course students can

1. Get knowledge of sensors used in agriculture field
2. Learn continuous and batch process
3. Learn greenhouse automation schemes
4. Learn Instrumentation in Irrigation

Course Outcomes:

After completion of this course student will

1. Able to test soil and water parameters.
2. Able to develop their own juice extract plant.
3. Able to developed their own green house

PHY-3611 SEC (AC): RADIATION PHYSICS

Course Objectives:

1. Students should understand the mechanism of interaction of various types of radiations with matter.
2. Students should get acquainted with principles of Measurement radiation levels, design principles and and actual implementation of variety of radiation detectors.
3. Students should learn about standards regarding safety levels laid down by National and International agencies, methods adapted to maintain safety standards in various places and methods of shielding.
4. Students should study the applications of radiations in various fields.

Course outcomes:

1. Students can use the knowledge in the applications of Radiation Physics in the fields like radio carbon dating, medical diagnostic tools.
2. Students acquire skill in operating different types of radiation detectors to detect and measure radiation levels in different places.
3. Students can work as advisers in maintenance of radiation safety standards and following of strict protocols at various places like Hospitals, Industry, and Laboratories etc.
4. Students become able to employ their skills to develop applications of radio activity in the fields like agriculture, industry, hospitals etc.

PHY-3611 SEC (AD): PHOTOGRAPHY

Objectives:

- To create general awareness and interest in photography process.
- To make students familiar with the Photographic equipment and handling techniques.
- To help students to learn basic photographic and image processing skills.

Course Outcomes: After successful completion of this course, student will be able to

- Understand the basic principle, structure and handling techniques in digital photography.
- Students will be able to develop and apply photographic skills using digital photography tools including digital editing, saving, sizing, and posting of the images

 Student gets proficient at the technical aspect of photographing with a digital camera.

 Students can identify and apply appropriate business practices specific to the self-employed professional photographer

2. CHEMISTRY

DSEC-I: CH-501: PHYSICAL CHEMISTRY- I

1. Quantum Chemistry [10 L]

Introduction, de Broglie hypothesis, The Heisenberg's uncertainty principle, quantisation of energy, Operators, Schrodinger wave equation, well behaved function, Particle in a one-, two and three-dimensional box (no derivation), Physical interpretation of the ψ and ψ2, sketching of wave function and probability densities for 1D box, degeneracy, applications to conjugated systems, zero-point energy and quantum tunnelling, Numerical

Expected learning Outcome:

After successfully completion, students will be able to:

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. Understanding of De Broglie hypothesis and the uncertainty principle
5. Understanding the operators: Position, momentum and energy
6. Solving Schrodinger equation for 1D, 2D and 3D model
7. Physical interpretation of the ψ and ψ2 and sketching the wave function
8. Applications to conjugated systems, zero-point energy and quantum tunnelling, Numerical Problems

Raman Spectroscopy: Introduction, Classical and Quantum theory of Raman effect, Rayleigh, Stokes and anti-stokes lines, Pure rotational Raman spectra of linear diatomic molecules

Expected learning Outcome: After studying this chapter, the student will be able to:

1. Understand the term additive and constitutive properties.

2. Understand the term specific volume, molar volume and molar refraction.

3. Understand the meaning of electrical polarization of molecule, induced and orientation polarization.

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. Rotational spectra of rigid diatomic molecules, selection rules, nature of spectral lines.

8. Simple Harmonic oscillator model, Born-Oppenheimer approximation. Vibrational spectra of diatomic molecules selection rules, nature of spectral lines.

9. Explain the difference between Rayleigh, Stokes and anti-Stokes lines in a Raman spectrum.

10. Justify the difference in intensity between Stokes and anti-Stokes lines.

11. Draw the Stokes and anti-Stokes lines in a Raman spectrum

12. Raman spectra: Concept of polarizability,

13. Pure rotational Raman spectra of diatomic molecules, Energy Expression, Selection rule, Rotational energy level diagram, Rotational Raman spectrum and Problems

3. Photochemistry [10 L]

Introduction, Difference between thermal and photochemical processes, Laws of photochemistry: i) Grothus - Draper law ii) Stark-Einstein law, Quantum yield, Reasons for high and low quantum yield., Factors affecting Quantum yield, Experimental method for the determination of quantum yield, types of photochemical reactions - photosynthesis, photolysis, photocatalysis, photosensitization, Jablonski diagram depicting various processes occurring in the excited state: Qualitative description of fluorescence and phosphorescence, Chemiluminescence, Problems

Expected learning Outcome:

After studying this chapter, the student will be able to know and understand:

1. Difference between thermal and photochemical processes.

2. photochemical laws: Grothus - Draper law, Stark-Einstein law,

3. Quantum yield and reasons for high and low quantum yield,

4. factors affecting the quantum yield,

5. Experimental method for the determination of quantum yield

6. Photochemical reactions: photosynthesis, photolysis, photocatalysis, photosensitization

7. Various photochemical phenomena like fluorescence and phosphorescence, Chemiluminescence,

8. Problems

4. UV-Visible spectroscopy (10 L)

Course outcome: After completion of the course student should be able to

1. Define basic terms in gravimetry, spectrophotometry, qualitative analysis and parameters in instrumental analysis. Such as: Gravimetry, precipitation, solubility product, ionic product, common ion effect, precipitating agent, washing of ppt., drying and ignition of ppt., linearity range, detection limit, precision, accuracy, Sensitivity, Selectivity, Robustness and Ruggedness, electromagnetic radiations, spectrophotometry, Beers law, absorbance, transmittance, molar absorptivity, monochromator, wavelength of maximum absorbance, metal ligand ration, qualitative analysis, group reagent, dry tests, wet test, confirmatory test, precipitation, thermogravimetry, thermogram, percent wt. loss, differential thermal analysis, etc.

2. Identify important parameters in analytical processes or estimations. Example: minimum analyte concentration in particular method, reagent concentration in particular analysis (gravimetry, spectrophotometry, thermogravimetry), reagent for particular analysis, reaction condition to convert analyte into measurable form, drying and ignition temperature for ppt in gravimetry, heating rate thermogravimetry, wavelength in spectrophotometry, group reagent, removal borate and phosphate in qualitative analysis, etc.

3. Explain different principles involved in the gravimetry, spectrophotometry, parameters in instrumental analysis, qualitative analysis.

4. Perform quantitative calculations depending upon equations student has studied in the theory. Furthermore, student should able to solve problems on the basis of theory.

5. Discuss / Describe procedure for different types analyses included in the syllabus.

6. Select particular method of analysis if analyte sample is given to him.

7. Differentiate / distinguish / Compare among the different analytical terms, process and analytical methods.

8. Demonstrate theoretical principles with help of practical.

9. Design analytical procedure for given sample.

10. Apply whatever theoretical principles he has studied in theory during practical session in laboratory.

DSEC-II: CH-504: INORGANIC CHEMISTRY – I

1. Molecular Orbital Theory of Coordination Compounds (8L)

Electro-neutrality principle, multiple bonding (dπ-pπ and dπ-dπ), Nephelauxetic effect and Nephelauxetic series (Recapulation from VBT and CFT), Need and introduction of MOT, Assumptions, MO treatment to octahedral complexes with sigma bonding, Formation of MO's from metal orbitals and Composite Ligand Orbitals (CLO), MO correlation diagram for octahedral complexes with sigma bonding, effect of π bonding on MO correlation diagram, Charge transfer spectra, Advantages of MOT over VBT and CFT.

Aims and objective/Learning Outcomes: A student should know:

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.

2. Inorganic Reaction Mechanism (6L)

Basic concepts of stability and lability, stability constants, Factors affecting lability, chelate effect. Classification of inorganic reactions, ligand substitution reactions: Intimate and stoichiometric mechanism of ligand substitution. Substitution Reactions in Four Coordinated square planar complexes: Trans effect and Trans effect series, applications of trans effect, stereochemistry of substitution.

Aims and objective: A student should know:

i. To understand about inert and labile complexes and stability of complexes in aqueous solutions

ii. Classification of reactions of coordination compounds

iii. The basic mechanisms of ligand substitution reactions.

iv. Substitution reactions of square planer complexes.

v. Tran's effect and applications of Trans effect

vi. Stereochemistry of mechanism

vii. Gain the knowledge of inorganic reaction mechanisms available in the literature to solve chemical problems.

3. Chemistry of Transition elements [6L]

Position in periodic table, electronic configuration, trends in properties w.r.t.(a) size of atoms and ions (b) reactivity (c) catalytic activity (d) oxidation state (e) complex formation ability (f) colour (g) magnetic properties (h) non-stoichiometry (i) density, melting & boiling points. [Ref.-1]

Aims and objective: A student should know:

1. To know position of d-block elements in periodic table.

2. To know the general electronic configuration & electronic configuration of elements.

3. To know trends in periodic properties of these elements w.r.t. size of atom and ions, reactivity, catalytic activity, oxidation state, complex formation ability, color, magnetic properties, non-stoichiometry, density, melting point, boiling point.

II. Actinides:

Position in periodic table, names and their electronic configurations. IUPAC nomenclature system for super heavy elements, Oxidation States, Occurrence and general methods of preparation of transuranic elements *viz.*, Neutron Bombardment, Accelerated projectile bombardment and Heavy ion bombardment. Nuclear Fuels-Nuclear fission and fusion fuels, comparison between Lanthanides and Actinides. [Reference-1]

Aims and objective: A student should know:

1. The meaning of term f-block elements, Inner transition elements, lanthanides, actinides.

2. Electronic configuration of lanthanides and actinides.

3. Oxidation states of lanthanides and actinides and common oxidation states.

4. Separation lanthanides by modern methods.

5. Lanthanide contraction and effects of lanthanide contraction on post-lanthanides.

6. Use of lanthanide elements in different industries.

7. Transuranic elements.

8. Preparation methods of transuranic elements.

9. Nuclear fuels and their applications.

10. Why transuranic elements are called as the synthetic elements?

11. IUPAC nomenclature for super heavy elements with atomic no. 100 onwards.

5. Metals, Semiconductors and Superconductors [8L]

Introduction, Metallic bonding, Band theory in metals with respect to Na along with n (E) and N(E) diagrams, Electrical conductivity of metals (Na, Mg, Al), Valence electrons and conductivity of metals, Effect of temperature and impurity on electrical conductivity of metals, Semiconductors, types of Semiconductors: I. Intrinsic II. Extrinsic, effect of temperature and impurity on semiconductivity, n & p type semiconductors ZnO and NiO, Superconductivity: Discovery, property, models, structure and superconductivity, low and high temperature superconductors, applications of superconductors.

Aims and Objectives: A student should be able –

1. The meaning of metal & semiconductor.

2. The difference between metal, semiconductor and insulator.

3. Metallic bond on the basis of band theory.

4. The energy band and energy curve.

5. Draw n (E) & N (E) curves.

6. Explain the electrical conductivity of metals with respect to valence electrons.

7. Explain the effect of temperature and impurity on conductivity of metals and semiconductors.

8. Intrinsic and extrinsic semiconductor.

9. The term valance band and conduction band.

10. n and p type of semiconductors.

11. Non-stoichiometry and semi conductivity.

12. Insulators on the basis of band theory.

13. The difference between Na, Mg, and Al in terms of valence electrons and conductivity.

14. Meaning of super conductors and their structure. o. Discovery and applications of superconductors.

DSEC-II: CH-505: INDUSTRIAL CHEMISTRY – I

1. Modern Approach to Chemical Industry (6 L)

Introduction, basic requirements of chemical industries, chemical production, unit process and unit operations, Quality control and quality assurance, process control, research and development, human resource, safety measures, classification of chemical reactions, batch and continuous process, Conversion, selectivity and yield, copy-right act, patent act, trademarks.

Ref. No.-7, Relent pages, Ref. - 10: www.wikipedia.org/wiki/copyright_act_of1976/patent act/ trademark

Aims and Learning objectives: The students are expected to learn;

i. Importance of chemical industry,

ii. Meaning of the terms involved,

iii. Comparison between batch and continuous process,

iv. Knowledge of various industrial aspects

2 Manufacture of Basic Chemicals (7 L)

a) Ammonia: Manufacture of ammonia by modified Haber-Bosch process, Physico-chemical principles involved and uses of ammonia.

b) Nitric acid: Manufacture of nitric acid by Ostwald's process, Physico-chemical principles involved and uses of nitric acid.

c) Sulphuric acid: Manufacture of sulphuric acid by contact process, Physico-chemical principles involved and uses of sulphuric acid.

Reference No.-1: Page No. 731 to 761, 809 to 844, Reference-3: 1128-1175, 1253-1263

Aims and Learning objectives: The students are expected to learn

i. Concept of basic chemicals,

ii. Their uses and manufacturing process.

iii. They should also know the physico-chemical principals involved in manufacturing process

3. Sugar and Fermentation Industry (7 L)

a. Sugar: Introduction, manufacture of cane sugar, extraction of juice, purification of juice, sulfitation and carbonation, evaporation, crystallization, separations of crystals, drying refining, grades, recovery of sugar from molasses, by-product of sugar industry,

Reference No.-1: Page No.1208- 1218

b. Fermentation Industry: Introduction, importance, conditions favorable for fermentation, Characteristics of enzymes, short account of some fermentation processes, Alcohol beverages, Manufacture of beer, manufacture of sprit, manufacture of wines, manufacture of vinegar, manufacture of power alcohol, ethyl alcohol from molasses.

Reference No.-1: Page No. 1176-1184

Aims and Learning objectives: The students are expected to learn

Sugar Industry: The students are expected to learn

i. Importance of sugar industry,

ii. Manufacture of direct iii. Consumption (plantation white) sugar with flow diagram.

iii. Cane juice extraction by various methods,

iv. Clarification by processes like carbonation, vi. Sulphitation, vii. Phosphatation, etc.

v. Concentration of juice by using multiple effect evaporator system,

vi. Crystallization of sucrose by using vacuum pan.

Fermentation Industry- The students are expected to learn

i. Importance,

ii. Basic requirement of fermentation process,

iii. Manufacturing of ethyl alcohol by using molasses and fruit juice.

4. Soap and detergents (8 L)

(a) Soap: Soap and Fatty Acids: Introduction, Chemistry, Manufacturing Technology, Raw Materials, Functional Properties of Soap, Manufacturing Processes, Saponification Reactor, Cooling, Soap Separator, Soap Extraction, Centrifugation, Neutralization, Direct Neutralization, Carbonate Neutralization, Partial Neutralizing with Soda Ash, Carbon Dioxide Separation, Raw Material Dosing, Caustic Soda, Completion of Neutralizing with Caustic Soda, Neutralization Soap Viscosity,

(b) Detergents: Synthetic Detergents: Introduction, Characteristic Features of Surfactants, Raw Materials for Surfactant Production, intermediates for Surfactant Production, Anionic Surfactants, Non-ionic Surfactants, Amphoteric Surfactants, Cationic Surfactants, Detergent Additives, Production of Synthetic Detergents, and Washing action of soap and detergents.

Aims and Learning objectives: The students are expected to learn

i. Different types of soap products,

ii. Chemistry of soap.

iii. Raw materials required for soap manufacture

iv. Meaning of the term's Surfactants, Types of surfactants

v. Raw materials for detergents

vi. Detergent builders, additives

vi. Washing action of soap and detergents

5. Dyes and Pigments (8 L)

(a) Dyes: Introduction, qualities of good dye, Colour constituents (Chromophore, auxochrome), classification of dyes according to their application, Synthesis and uses of following dyes: Nitroso dye-martius yellow, Azo dyes-Methyl orange and aniline yellow, Triphenylmethane dye-Crystal violet, Phthalein dye - Phenolphthalein, Xanthane-Fluorescein, Antha-quinnoe-Alizarin and Indigo dyes - Indigo.

Reference -1: pp 1545-1595

(b) Pigments: Introduction, classification and general properties of pigments.

Inorganic pigments:

i) Zinc oxide pigments (Fundamentals and properties, Raw materials, Direct process (American process), Precipitation process)

ii) Iron oxide pigments (Fundamentals and properties, Production of iron oxide pigment by precipitation process),

Aims and Learning objectives: The students are expected to learn

Dyes - Students should know about

i. Dyes: introduction,

ii. Dye intermediates,

iii. Structural features of a dye;

iv. Classification of dyes,

v. Synthesis, Structures, properties and applications of dyes

Pigments: Students should know about

i. Introduction,

ii. Classification and general properties of pigment

iii. Production processes of zinc oxide and iron oxide

DSEC-III: CH-507: ORGANIC CHEMISTRY – I

Learning Outcomes

Chapter 1 Polynuclear and Heteronuclear Aromatic Compounds: After studying the polynuclear and heteronuclear aromatic compounds, students will able to

1. Define and classify polynuclear and hetreonuclear aromatic hydrocarbons.
2. Write the structure, synthesis of polynuclear and hetreonuclear aromatic hydrocarbons.
3. Understand the reactions and mechanisms
4. Explain the reactivity of polynuclear and hetreonuclear aromatic hydrocarbons.
5. Describe the synthesis of chemical reactions of polynuclear and hetreonuclear aromatic Hydrocarbons.

Chapter 2 Active Methylene Compounds : Students should be able to understand

1. Meaning of active methylene group
2. Reactivity of methylene group,
3. Synthetic applications ethyl acetoacetate and malonic ester
4. To predict product with panning or supply the reagent/s for these reactions

Chapter 3 Molecular Rearrangements Students will study

1. What is rearrangement reaction?
2. Different types of intermediate in rearrangement reactions?
3. To write the mechanism of some named rearrangement reactions and their applications 4. Electrocyclic rearrangement with their mechanisms Chapter

Chapter 4 Elimination Reactions: Students should be familiar with

1. 1,1 and 1,2 elimination
2. E1, E2 and E1cB mechanism with evidences of these reactions 4
3. Understand stereochemistry by using models and learn reactivity of geometrical isomers
4. Orientation and reactivity in E1 and E2 elimination
5. Hoffmann and Saytzeff's Orientation
6. Effect of factors on the rate elimination reactions

DSEC-III: CH-508: CHEMISTRY OF BIOMOLECULES

Learning Outcome:

1. Introduction to molecular logic of life. 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. Concepts of biomolecules, Bonds that link monomeric units to form macromolecules

2. **Carbohydrates:** 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. **Lipids:** The student needs to know the types of lipids with examples, structure of lipids, properties of lipids

4. **Amino acids and proteins:** The student will understand the structure and types of amino acids. Reactions of amino acids. Properties of amino acids. Peptide bond formation. Types of proteins. Structural features in proteins. Effect of pH on structure of amino acid, Determination of N and C terminus of peptide chain.

5. **Enzymes:** 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. **Hormones:** 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

Learning Outcomes:

A) Separation of Binary Mixtures and Qualitative Analysis The students will be able to

1. Perform the quantitative chemical analysis of binary mixture, explain principles behind it.
2. Separate, purify and analyse binary water insoluble mixture.
3. Separate, purify and analyse binary water-soluble mixture.
4. Understand the techniques involving drying and recrystallization by various method.
5. Familiarize the test involving identification of special elements.
6. Learn the confirmatory test for various functional groups.

B) Preparations The students will be able to

1. Systematic working skill in laboratory will be imparted in student.
2. Learn the basic principles of green and sustainable chemistry.
3. Synthesis of various organic compounds through greener approach.
4. Do and understand stoichiometric calculations and relate them to green process metrics.
5. Learn alternative solvent media and energy sources for chemical processes.
6. Learn the preparations of derivative various functional groups aspects of electrical experiments.
7. Understand the techniques involving drying and recrystallization by various method
8. Expertise the various techniques of preparation and analysis of organic substances

9. Understand principle of Thin Layer Chromatographic techniques.

10. Understand the purification technique used in organic chemistry.

CH-510 (A) : INTRODUCTION TO MEDICINAL CHEMISTRY

Learning Outcomes:

Upon completion of the course the student shall be able to understand,

1. The basics of medicinal chemistry, biophysical properties, overview of basic concepts of traditional systems of medicine.

2. Over view of the overall process of drug discovery, and the role played by medicinal chemistry in this process.

3. Biological activity parameters and importance of stereochemistry of drugs and receptors.

4. Knowledge of mechanism of action of drugs belonging to the classes of infectious and non-infectious diseases.

5. Enhancement of practical skills in synthesis, purification and analysis.

CH-510 (B) : POLYMER CHEMISTRY

Course Outcome: The students are expected to learn the following aspects of Polymer Chemistry:

1) History of polymers.

2) Difference between simple compounds and polymer.

3) Names of polymers.

4) Various ways of nomenclature.

5) Difference between natural, synthetic, organic and inorganic polymers.

6) Terms-Monomer, Polymer, Polymerization, Degree of polymerization, Functionality, Number average, Weight average molecular weight.

7) Mechanisms of polymerization.

8) Polymerization techniques.

9) Uses & properties of polymers.

10) Role of polymer industry in the economy.

SEC-II: CH-511: SKILLS ENHANCING COURSE-II

Aims and objectives: -Students should know:

i. Importance and conservation of environment.

ii. Importance of biogeochemical cycles

i. Water resources

ii. Hydrological Cycle

iii. Organic and inorganic pollutants

iv. Water quality parameters

CH-511 (B) : CHEMINFORMATICS

1. Introduction to Cheminformatics [02L]

1.1. History and progression of cheminformatics

1.2. Significance of cheminformatics

1.3. Prospects of cheminformatics and Molecular Modelling

Learning Outcomes:

1. Students should understand the significance of cheminformatics in the modern practices of chemical science

2. Students should learn the necessity of cheminformatics in chemical science

2. Representation of Molecules and Chemical Reactions: **[10L]**

2.1. Nomenclature

2.2. Different types of notations

2.3. Canonical representation of chemical structure, SMILES notation

2.4. 2D representation of chemical structure; Graph Theory, Connection tables and linear notations, Matrix representations

2.5. 3D chemical structure representation and molecular structure file formats; Molfiles, Sdfiles and Pdbfiles

2.6. 3D molecular structure visualization

2.7. Chemical Libraries (Pubchem, ChEMBL, DrugBank and Zinc) and online Available cheminformatics toolkits

2.8. Molecular properties calculations; electronic effects, Reaction classification

Learning Outcomes:

1. Students should learn the basic concepts about these representation methods.

2. Students should understand the significance of different representation methods for their specific applications.

3. Students should able to identify these representation methods with understanding.

4. Students should able to read these representation methods for basic examples.

3. Searching Chemical Structures: **[06L]**

3.1. Basic ideas about the Full structure search, Sub-structure search

3.2. Basics of similarity and diversity search; Tanimoto, Dice, Cosine coefficient and Euclidean distance

3.3. Basics of three dimensional search methods

3.4. Basics of computation of physical and chemical data and structure descriptors.

Learning Outcomes:

1. Students should learn the basic concepts of referencing

2. Students should understand the significance of structural data in the process of referencing

3. Students should able to correlate the necessity of input methods and the expected outcomes for the set of chemicals

4. Students should able to understand data interpretation using these methods for basic or representative molecules.

4: Applications of Cheminformatics: [18 L]

4.1. Prediction of Properties of Compounds: Linear Free Energy Relations; Quantitative Structure-Property Relations; Descriptor Analysis; Model Building; Modeling Toxicity

4.2. Predictive Methods for Organic Spectral Data Simulation: Spectra prediction methods and tools, open source and propriety tools, spectra viewer programs, Structure-Spectra correlations

4.3. Introduction to computer aided drug design: Computer Assisted Synthesis Design; Target Identification and Validation; Lead Finding and Optimization; Combinatorial library design,

Virtual screening, Molecular docking and Molecular Dynamics simulation. Pharmacophore modeling; Ligand-Based and Structure Based virtual screening, Drug likeness properties, Protein Ligand Interaction Profile (PLIP) analysis and its application in drug discovery process

4.4. Machine Learning Methods in Cheminformatics

4.5. Introduction to Cheminformatics Softwares: Basic operational principle and applications of MarvinSketch, Discovery Studio, Gaussian, GOLD, Schrodinger, Expert protein Analysis System (Expasy) online server

Learning Outcomes:

1. Students should learn the basic idea about how to apply cheminformatics tool for variety of applications.

2. Students should understand the significance of database for the specific purpose of application.

3. Students should able to correlate the content of data with the possible applications for the set of chemicals.

4. Students should get aware with the principle and the basic operational methods of well-practiced software used in the data interpretation in cheminformatics.

5. Students should learn the basic concepts of Machine Learning and Artificial intelligence

DSEC-IV: CH-601 : PHYSICAL CHEMISTRY-II

Expected learning Outcomes:

After studying this chapter, the student will be able to know and understand:

1. Electrochemical cells: Explanation of Daniell cell, Conventions to represent electrochemical cells

2. Thermodynamic conditions of reversible cell, Explanations of reversible and irreversible electrochemical cell with suitable example,

3. EMF of electrochemical cell and its measurement.

4. The Weston standard cell

5. The primary reference electrode: The standard hydrogen electrode (SHE) with reference to diagram, Construction, representation, working and limitation,

6. Secondary reference electrodes: (a) The calomel electrode, (b) The glass electrode (c) The silver-silver chloride electrode. Understanding of these electrodes with reference to diagram, representation, Construction, working

1. Distinguish between crystalline and amorphous solids / anisotropic and isotropic solids.

2. Explain the term crystallography and laws of crystallography.

3. Weiss and Millers Indices, determination of Miller Indices

4. Bravais lattices, space groups, seven crystal systems and fourteen Bravais lattices;

5. Cubic lattice and types of cubic lattice

6. Distance between the planes for 100, 110 and 111 for cubic lattice

7. Methods of Crystal structure analysis: The Laue method and Braggs method: Derivation of Bragg's equation,

8. Determination of crystal structure of NaCl by Bragg's method,

9. X ray analysis of NaCl crystal system and Calculation of d and λ for a crystal system,

DSEC-IV: CH-602 : PHYSICAL CHEMISTRY-III

Expected learning Outcomes:
After studying this topic students are expected to know

1. Meaning of the terms-Solution, electrolytes, nonelectrolytes and colligative properties,

2. Lowering of vapour pressure of solvent in solution,

3. Elevation of B.P. of solvent in solution, Landsberger's method,

4. freezing point depression, Beckmann's method Osmosis and Osmotic pressure, Berkeley and Hartley method,

5. Application of colligative properties to determine molecular weight of nonelectrolyte, abnormal molecular weight,

6. Relation between Vant Hoff's factor and degree of dissociation of electrolyte by colligative property,

7. Problems.

1. Factors affecting on solid state reactions,

2. Rate laws for reactions in solid state

3. Applying rate laws for solid state reactions

4. Results of kinetics studies

DSEC-V: CH-604 : INORGANIC CHEMISTRY –II

Aim and Objectives: Students should be able:

i. To understand M-C bond and to define organometallic compounds

ii. To define organometallic chemistry

iii. To understand the multiple bonding due to CO ligand.

iv. To know methods of synthesis of binary metal carbonyls.

v. To understand the structure and bonding using valence electron count (18 ele. rule)

vi. To understand the catalytic properties of binary metal carbonyls.

vii. To understand the uses of organometallic compounds in the homogenous catalysis.

viii. Chemistry of ferrocene

i. Understand the phenomenon of catalysis, its basic principles and terminologies.

ii. Define and differentiate homogeneous and heterogeneous catalysis.

iii. Give examples and brief account of homogeneous catalysts.

iv. Understand the essential properties of homogeneous catalysts-Give the catalytic reactions for Wilkinson's Catalysis, hydroformylation reaction, Monsanto acetic acid synthesis, Heck reaction

v. Understand the principle of heterogeneous catalyst and development in it.

vi. Give examples of heterogeneous catalysts.

vii. Understand the classification and essential properties of heterogeneous catalysts.

viii. Give the brief account of Hydrogenation of olefins , Zeolites in catalysis, biodiesel synthesis, Automotive Exhaust catalysts

ix. Understand the catalytic reactions used in industries around.

i. Identify the biological role of inorganic ions & compounds.

ii. Know the abundance of elements in living system and earth crust.

iii. Give the classification of metals as enzymatic and non-enzymatic.

iv. Understand the role of metals in non-enzymatic processes.

v. Know the metalloproteins of iron.

vi. Explain the functions of hemoglobin and myoglobin in O2 transport and storage.

vii. Understand the toxicity of CN- and CO binding to Hb.

viii. Draw the structure of Vit.B12 and give its metabolism.

i. know thy types of Inorganic polymers

ii. comparison with organic polymers

iii. synthesis, structural aspects of Inorganic polymers

iv. understand the polymers of Si, B, Si and P

v. Inorganic polymers and their use.

i. Understand Preparation of inorganic solids by various methods,

ii. Inorganic liquid crystals

iii. Ionic liquids, their preparations, and their significance w.r.t green chemistry.

iv. Technological importance of ionic liquids,

DSEC-V: CH-605: INORGANIC CHEMISTRY –III

Aims and objectives: A student should:

1. Student will learn the concept of acid base and their theories.
2. They will also come to know different properties of acids and bases.
3. Strength of various types acids.
4. How acid and base strengths get affected in non-aqueous solvents.

1. Know the nature of solids.
2. Know the crystal structures of solids.
3. Draw the simple cubic, BCC and FCC structures.
4. Identify the C.N. of an ion in ionic solid.
5. Identify the type of void.
6. Know the effect of radius ratio in determining the crystal structure.
7. Be able to define Pauling's univalent radius and crystal radius.
8. Be able to solve simple problems based on Pauling's univalent radii and crystal radii.
9. Know how to draw Born-Haber cycle.
10. Be able to solve simple problems based on Born- Haber cycle.
11. Know the defects in Ionic solids.
12. Be able to differentiate between the defects.

i) To know toxic chemical in the environment.
ii) To know the impact of toxic chemicals on enzyme.
iii) To know the biochemical effect of Arsenic, Cd, Pb, Hg.
iv) To explain biological methylation.

DSEC-VI: CH-607: ORGANIC CHEMISTRY-II

Students will learn the interaction of radiations with matter. They will understand different regions of electromagnetic radiations. They will know different wave parameters.

1. Students will learn the principle of mass spectroscopy, its instrumentation and nature of mass spectrum.
2. Students will understand the principle of UV spectroscopy and the nature of UV spectrum. They will learn types of electronic excitations.
3. Students will be able to calculate maximum wavelength for any conjugated system. And from the value of λ-max they will be able to find out the extent of conjugation in the compound.
4. Students will understand the principle of IR spectroscopy, types of vibrations and the nature of IR spectrum.
5. From the IR spectrum, they will be able to find out IR frequencies of different functional groups. And thus, they will be able to find functional groups present in the compound.
6. Students will understand the principle of NMR spectroscopy and will understand various terms used in NMR spectroscopy. They will learn measurement of chemical shift and coupling constants.
7. Students will be able to interpret the NMR data and they will be able to use it for determination of structure of organic compounds.
8. Students will be able to determine the structure of simple organic compounds on the basis of spectral data such as λ max values, IR frequencies, chemical shift (δ values).
1. The use of models to draw different types of disubstituted cyclohexanes in chair form
2. The geometrical isomerism in disubstituted cyclohexanes
3. The stability, energy calculations and optical activity of these conformers
4. The use models and to draw different types of conformational isomers of decalin in chair form
5. To know the stability of geometrical isomers of decalin

DSEC-VI: CH-609: ORGANIC CHEMISTRY PRACTICAL-II

Learning Outcomes:

A) Interpretations of IR and PMR Spectra The students will be able to

1. Explain "fingerprint region" of an infrared spectrum can used in the identification of an unknown compound.
2. Identify the functional group or groups present in a compound.

3. Identify the broad regions of the infrared spectrum in which occur absorptions caused by N−H, C−H, and O−H, C≡C and C≡N, C=O, C=N, and C=C.
4. Understand use NMR spectra to determine the structures of compounds.
5. Interpret integration of NMR spectra
6. Calculate coupling constants from 1 H NMR spectra.
7. Interpret elemental analysis technique

B) Organic Estimations The students will be able to

1. Practical knowledge of handling chemicals.
2. Achieve the practical skills required to estimations of glucose and glycine.
3. Achieve the practical skills required to Saponification value of oil.
4. Determine the molecular weight of given tribasic acids.

C) Organic Extractions The students will be able to

1. Apply the principles of extraction
2. Understand the equipment for extraction.
3. Gain practical hands-on experience of modern Extraction.
4. Develop basic design of extractor
5. Describe the extraction separation process.

D) Column chromatography The students will be able to

1. Defines the basic parameters in chromatography
2. Explain the processes of a chromatography analysis
3. Describes the types and materials of column.
4. Explains the types of mobile phase and elution.
5. Realize the selection of appropriate mobile phase, column and detector

SEC-III: CH-610: SKILL ENHANCING COURSE-III

Learning Objectives:

1) Know the different components and properties of soil.

2) Know classification of soil on the basis of pH.

3) Identify the problematic soil and recommend method for their reclamation.

4) Know the different plant nutrients required for plants and their functions.

5) Know the role of various fertilizers and manures required for plant growth.

6) Know the various methods and their techniques in analysis of soil.

7) Know importance of manures as compared to chemical fertilizers.

8) Know various techniques to protect the plants.

9) Have the knowledge of various pesticides, insecticides, fungicides and herbicides.

Course Outcomes:

After studying this course, student is expected to

1) Understood various components of soil and soil properties and their impact on plant growth.

2) Understood the classification of the soil.

3) Explores the problems and potentials of soil and decide the most appropriate treatment for land use.

4) Understood the Reclamation and management of soil physical and chemical constraints.

5) Useful in making decisions on nutrient dose, choice of fertilizers and method of application etc. practiced in crop production.

6) Got experience on advanced analytical and instrumentation methods in the estimation of soil.

7) Understood various Nutrient management concepts and Nutrient use efficiencies of major and micronutrients and enhancement techniques.

8) Proper understanding of chemistry of pesticides will be inculcated among the students.

9) 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

Learning Objectives: After studying this paper the students will know –

a. The significance of forensic science to human society.

b. The fundamental principles and functions of forensic science.

c. The work nature in a forensic science laboratory.

d. Encourage academic students towards the noble career

a. The forensic identification of illicit liquors.

b. The classification and characteristics of the narcotics, drugs and psychotropic substances.

c. The menace of designer drugs.

d. The methods of identifying of narcotics, drugs and psychotropic substance

SEC-IV: CH-610: SKILL ENHANCING COURSE-IV

Course outcome: After completion of the course student should able to

1. Define basic terms in solvent extraction, basics of chromatography, HPLC, GC, and AAS and AES. Some important terms are: solvent extraction, aqueous and organic phase, distribution ratio and coefficient, solute remain unextracted, percent extraction, ion association complex, theoretical plate, HETP, retention time, selectivity, resolution, stationary phase, normal and reverse phase, ion exchange, column efficiency, carrier gas, split and spitless injection, packed column, tubular column, atomic absorption and emission spectroscopy, electronic excitation in atoms, nebulization, atomization, reduction of metal ions in flame, absorbance by atoms in flame, flame atomizers, furnace atomizers, interference in AES and FES, HCL, hydride generator, etc.

2. Identify important parameters in analytical processes or estimations. Example: minimum analyte concentration in particular method, reagent concentration for particular analysis, reagent for particular analysis, reaction condition to convert analyte into measurable form, wavelength selection in HPLC with spectrophotometric and fluorometric detector, solvent or carrier gas in HPLC and GC, choice method for the sample preparation in atomic spectroscopic methods, choice of filter and HCL in atomic spectroscopic methods, etc.

3. Explain different principles involved in the analyses using solvent extraction, basics of instrumental chromatography, HPLC, GC, and atomic spectroscopic techniques.

4. Perform quantitative calculations depending upon equations students has studied in the theory. Furthermore, student should able to solve problems on the basis of theory.

5. Discuss / Describe procedure for different types analyses included in the syllabus.

6. Select particular method of analysis if analyte sample is given to him.

7. Differentiate / distinguish / compare among the different analytical terms, process and analytical methods.

8. Demonstrate / explain theoretical principles with help of practical.

9. Design analytical procedure for given sample.

10. Apply whatever theoretical principles he has studied in theory during practical in laboratory.

3. ZOOLOGY

Zoology is one of the major subjects of Basic Sciences and deals with all aspects of animal biology. It includes an interesting range of highly diverse topics. A zoology student needs to gain understanding of many areas of the subject to keep pace with advancements in Life Sciences. This under-graduate degree program has been designed by the Board of Studies in Zoology of Savitribai Phule Pune University with a substantial component of what is needed from a zoologist as a skilled career and what zoologists needs to pursue for post-graduation and further academic studies. It follows the guidelines laid down by the University Grants Commission, New Delhi. This newly designed curriculum is a perfect blend of the classical aspects in Zoology with the advanced and more specialized areas.

SEMESTER – V

ZO 351 - PEST MANAGEMENT

Course Objectives:

After you complete your study of this unit, you should be able to:

 Explain why identification of the pest is the first step in developing an effective pest control strategy.

 Explain the differences between continuous pests, sporadic pests, and potential pests.

 Explain what is meant by prevention, suppression, and eradication of pests.

 Describe "thresholds" and why they are an important consideration in developing a pest control strategy.

 Describe "monitoring" as it relates to pest control and explain why it is important to pest control strategy.

Course Outcomes:

1. Define pest management.
2. Describe the economic, ecological, and sociological benefits of IPM.
3. Distinguish positive and negative impacts of pesticide use.
4. Understand problems resulting from misuse, overuse, and abuse of chemical pesticides.

5. Define and describe pesticide resistance and how it develops.

6. Identify ecological and biological characteristics important in development of pest populations.

7. Identify 10 tactics commonly used in IPM and be able to distinguish them.

8. Understand society's role in IPM decisions.

9. Describe different groups of pests and compare them to weeds and plant pathogens.

10. Analyse and compare management tactics to determine the best approach to reducing pest populations, weeds, and disease presence.

11. Locate appropriate, scientifically valid sources of information on specific tactics to manage insect pests, weeds, and diseases.

12. Know and how to develop an IPM program.

ZO 352 – HISTOLOGY

Objectives –

1. To understand the histological aspects of mammalian organs.
2. To study the important features of different types of tissues in organ system.
3. To understand the classification of various types of basic tissues.
4. To study structure & functions of various tissues in organ system.
5. To understand histological structure of various glands and its functions.

Learning Outcomes for the course –

1. The students will be able to understand, classify and identify the different types of tissue.
2. The students will understand the complexity of various tissues in an organ.
3. The students will be able to learn structure & functions of various tissues.
4. The students will understand the various diseases related to organs.
5. The student will be able to know the role of glands in mammals.

ZO 353 - BIOLOGICAL CHEMISTRY

Objectives –

1. To understand the basic concepts and significance of biochemistry.
2. To understand the basic concepts pH and Buffers
3. To understand the chemical structures of carbohydrate, and their biological and clinical significance.
4. To understand the structure and importance of proteins and lipids
5. To understand the variations in enzyme activity and kinetics.

Learning Outcomes for the course -

1. Learners shall be able to understand basic concepts and significance of biochemistry
2. The students will learn about the pH and Buffers.
3. The students will learn about the chemical structures of carbohydrate, and their biological and clinical significance.
4. The students will be able to understand, interpret structure and importance of proteins, carbohydrates and lipids
5. Learners will be able to comprehend variations in enzyme activity and kinetics.

ZO 356 – PARASITOLOGY

Objectives:

1. To understand the basic terminologies in parasitology.
2. To understand the concepts of animal association with examples.
3. To understand the morphology and life cycle of common parasites (Protists and Platyhelminthes).
4. To understand the phenomenon of Host-parasite relationship.
5. Explain the importance of arthropod vectors with examples.

Learning outcomes:

1. The students will be able to learn about basics and scope of parasitology.

2. The students will be able to learn the types of host and parasite with examples.

3. The students will be able to learn about the morphology, life cycle, pathogenicity and treatment of common parasites (Protists and Platyhelminthes).

4. The students will be able to learn about host -parasite relationships and their effects on host body.

5. The students will be able to learn about the arthropod parasites and their role as vector.

ZO – 3511 POULTRY MANAGEMENT

Objectives:

1. To understand the basics of Poultry Farming and its important.

2. To understand breeding management of broilers and layers of chickens.

3. To understand housing management and equipment of Poultry farming.

4. To understand food, feeding and digestion mechanism of chickens.

5. To understand the poultry diseases and their control.

6. To understand the economic importance of poultry products.

Expected Outcome:

1. The students will be able to understand the Poultry farming practices.

2. The students will able to understand the poultry breeding techniques.

3. The students will be able to understand poultry rearing techniques.

4. The students will be able to understand feeding requirement and food ingredients.

5. The students will be able to understand the poultry disease and their pathogens.

6. The students will be able to understand market value of poultry products.

ZO 361 - MEDICAL & FORENSIC ZOOLOGY

Objectives:

1. To understand the scope, need and History of Forensic Science.

2. To understand the role of different institutes & allied institutes of Forensic Science.

3. To understand the various branches of Forensic Sciences from Life Sciences.

4. To understand human physiology, post mortal investigations.

5. To understand knowledge of handling different types of evidences and their examinations.

Expected Outcome

1. The students will be able to understand the basics principles of Medical and Forensic Zoology.

2. The students will able to understand scientific methods in crime detection.

3. The students will be able to understand the advancements in the field of Medical and Forensic Zoology.

4. The students will be able to understand modern tools, techniques and skills in forensic investigations.

5. The students will be able to describe the fundamental principles and functions of forensic science and its significance to human society.

ZO 362 - ANIMAL PHYSIOLOGY

Course Objectives:

1. To acquaint students with the principles and basic facts of Animal Physiology and with some of the laboratory techniques and equipment used in the attainment of physiological data. The importance will be on mammalian.

2. The course will focus on organ-system physiology,

3. Furthermore, emphasis will be placed on nutritive, circulatory, respiratory, excretory, muscular, nervous, reproductive and endocrine physiology. Where appropriate, basic chemical and physical laws will be reviewed in order to enhance and to promote student understanding.

4. The laboratory module of the course is designed to support the topics discussed in theory lecture, as well as to acquaint students with some of the laboratory techniques and equipment used in the gaining of physiological facts**.**

Learning Outcomes:

Upon successful completion of this course, the students will be able to describe, identify, and/or explain:

1. The various physiological organ-systems and their importance to the integrative functions of the human body.
2. Understand Concept of energy requirements
3. Various aspects of Digestive physiology.
4. Circulatory system with medical conditions
5. Understand Respiratory mechanism and gases transport.
6. Eliminations of waste materials from the body.
7. Develop understanding in Structure and functions of muscles
8. Understand formation of gametes and function of endocrine glands.

ZO 363 - MOLECULAR BIOLOGY

Objectives:

1. The course aims to provide students with an introduction of the underlying molecular mechanisms of various biological processes in cells and organisms.
2. To understand the Structure of DNA and RNA, DNA and RNA as genetic material
3. To understand the Central Dogma of Molecular Biology
4. To understand the concept of gene regulation
5. To understand the DNA Damage and Repair
6. The course aims to develop basic understanding of structure-function relationships of nucleic acids and proteins.

Learning outcomes:

1. Learner shall get an insight into molecular mechanisms of various biological processes in cells and organisms
2. Learner shall get an insight into the Structure of DNA and RNA, DNA and RNA as genetic material
3. The course shall prepare learner to get insight into the Central Dogma of Molecular Biology
4. Learner shall also understand the concept of gene regulation
5. Learner shall get an insight into the DNA Damage and Repair

ZO 364 – ENTOMOLOGY

Objectives:

1. To understand the scope of Entomology and general characters of Insects.
2. To study the morphology and anatomy of Insects.
3. To learn the concept of social organization in Insects.
4. To understand metamorphosis in Insects.
5. To study the economically important insects and Pest management of harmful insects.

Course outcomes:

At the end of this course, Students will -

1. Understand basic concepts in Entomology and its scope.
2. Learn morphology and anatomy of Insects.
3. Understand the concept of social organization in Insects.
4. Understand the development process of Insects.
5. Identify disease causing insect vectors.
6. Will be able to design and implement pest controlling methods against pests.

ZO 366 - EVOLUTIONARY BIOLOGY

Objectives:

1. To provide comprehensive overview of Concept of Evolution.
2. To explain Origin of Life especially Prokaryotes as well as Eukaryotes in detail.
3. To explore salient features of various theories of evolution comprising of Lamarckism, Darwinism and Neo-Darwinism.
4. To impart detailed understanding of Analogy, Homology, Paleontological Evidences, Embryological Evidences and Molecular Phylogeny.
5. To provide adequate information about Geological Time Scale and Neutral Theory of Molecular Evolution.
6. To develop comprehensive knowledge regarding various Sources of Variations and their role in evolution.

7. To give detailed explanation of key concepts of Population Genetics in terms of Hardy-Weinberg Law, Genetic Drift and Types of Natural Selection.

8. To provide adequate knowledge about Micro-evolutionary changes, Speciation and Adaptive Radiation.

9. To give detailed outline of Extinctions and its types.

10. To impart descriptive knowledge regarding Origin and Evolution of Man.

11. To provide glimpse of Phylogenetic Trees and highlight their construction along with interpretation

.

Learning outcomes

After completing the course, the student should be able to

1. Students will be able to learn most of the essential aspects of Evolutionary Biology in detail which will help them in acquiring better understanding regarding the subject.

2. Explain important processes, principles and concepts and critically evaluate theories and empirical research within evolutionary biology

3. Apply evolutionary theory and concepts to address empirical and theoretical questions in evolutionary biology.

4. Independently investigate evolutionary questions using literature and analyses of empirical data.

5. Communicate the principles, theories, problems and research results associated with questions that lie within the evolutionary framework to students

ZO 3611 - PROJECT

Students have to complete the research project in the stipulated time and present the dissertation at the time of the examination in a proper format. Students should be encouraged to take up laboratory work, hands-on practical investigation and design experimental setup. Field work to be carried out under proper supervision and permissions from the concerned authorities.

Possible key aspects of the project work -

1. Planning the project

2. Selecting a suitable title

3. Significance of the work

4. Hypothesis, Objectives

5. Reviewing the available literature

6. Methodology to be used

7. Outcomes of the Project work

8. Conclusion and Discussion

9. Future plans

Students should be made aware of plagiarism and research ethics.

4. BOTANY

- **Semester V**

PAPER I - BO 351: CRYPTOGAMIC BOTANY (ALGAE AND FUNGI)

CO1. The learner will get acquainted with life cycles of lower cryptogams.

CO2. The students will understand details and applications of algae, fungi.

CO3. The learner of the course will have an understanding of the phylogenetic relationship and role in human welfare.

PAPER II- BO 352 ARCHEGONIATE

CO1. The learner will get acquainted with life cycles of archegoniate.

CO2. The students will understand details and applications of bryophytes and pteridophytes.

CO3. The learner of the course will have an understanding of the phylogenetic relationship and role in human welfare.

PAPER III- BO 353 -SPERMATOPHYTA AND PALEOBOTANY

CO1. The learner will understand gymnosperms and angiosperms in details with classification, origin and study of angiosperm families

CO2. The student will be able to identify the plants based on various keys like Latin diagnosis, bracketed keys and also will be able to prepare artificial keys.

CO3. The student will learn to identify and classify the groups of plants according to their characters.

CO4. The students will understand importance of learning paleobotany, this will help in comparing the present day plants with primitive fossil plants.

PAPER IV- BO 354 - PLANT ECOLOGY

CO1. The learner of the course will have an interrelationship between the living world and environment.

CO2. The learners will understand environmental crisis, environmental impact assessment and environmental audit so as to know the responsibility.

CO3. The students of the course will also be acquainted with ecology and economics & remote sensing.

CO4. The students of the course will also be well versed with introduction of biodiversity, its aim, concept and objectives.

CO5. The learners of the course will be taught about characterization of biodiversity, by virtue of which they can understand the concept of endemism and phytogeography.

CO6. The students will be well versed with biodiversity loss, importance, IUCN categories and inventorying and monitoring of biodiversity.

CO7. The students of the course will understand current practices in conservation including in situ, ex situ and social approach to biodiversity conservation.

PAPER V - BO 355 - CELL AND MOLECULAR BIOLOGY

CO1. Organisation of cell its history and type of cells: prokaryotic and eukaryotic

CO2. Physical and chemical nature of cell matrix

CO3. Plant cell cytoplasmic constituents, cell organalles and their structure and function.

CO4. Learner will be acquainted with nuclear organization and chromosome structures , types and functions.

CO5. The student learn central Dogma of molecular biology, and various process involved in it.

CO6. Learner will be acquire knowledge related to genetic material, its nature, forms, various structure models and laws.

CO7. Learners will be enlightened with DNA replication, experiments invoeld in providing it and its mechanism, DNA damage and repair.

CO8. Students will also learn about gene organization, transcription, genetic code and

translation, gene activation and regulation.

PAPER VI - BO 356- GENETICS

CO1. Students will learn about concept of heredity and variation along with various branches and application of genetics

CO2. Learners will have basic information and understanding about Mendelism, terminology involved and various laws involved.

CO3. The students will make an understanding about interactions involved in genes Multiple allele using Nicotiana and Drosphila as model organism.

CO4. The learner of this course will have an understanding of quantitative and cytoplasmic inheritance and sex linked inheritance with reference to Drosophila

CO5. The student will learn about ploidy specifically euploidy and aneuploidy. They will be acquainted with chromosomal aberrations.

CO6. The students of the course will be introduced to theories of evolution Darwinism and Lamarckian and modern synthetic theory.

CO7. Students will be well versed with evidences of evolution and population genetics and evolution.

PAPER IX - BO 3510 - MEDICINAL BOTANY

CO1. The students will be introduced to pharmacognosy its origin history and scope.

CO2. The learner will be introduced to ayurvedic pharmacy, tridosha concept, ayurvedic principles and formulations.

CO3. The students will be made understand analytical medicinal botany along with cultivation, collection and processing of herbal drugs.

CO4. The course will also help the students to study the drugs w.r.t. occurrence distribution and cultivation, microscopic characters and constituents.

CO5. The learner of the course will have a in depth knowledge on applied medicinal botany, concepts of major metabolic pathway, ethnobotany.

PAPER X - BO 3511- PLANT DIVERSITY & HUMAN HEALTH

CO1: Student will understand plant diversity and importance of it in human health.

CO2: They will come to know about exotic species- Identification and morphological characteristics.

CO3: To make student realize ecological importance of plants and describe the role of plants in relation to Human health.

CO4: Students will know diversity issues and types of diversity, conservation strategies to implemented in their daily life.

CO5: The students will be made acquainted with agrobiodiversity and its importance in human health.

- **Semester VI**

PAPER I - BO 361- PLANT PHYSIOLOGY AND METABOLISM

CO1. The learner of the course will understand details on plant physiology, photosynthesis, and different pathways.

CO2. The students will have knowledge on respiration, structure of mitochondrion, and various cycles involved like glycolysis, TCA, ETS and ATP synthesis.

CO3. The learners will understand translocation of organic solutes, and stress physiology.

CO4: The learner should undertand the functional aspect of the plant's metabolism.

PAPER II - BO 362 - BIOCHEMISTRY

CO1. The learner is able to learn the mechanism of conversion of simple to complex components and their functions.

CO2. The learners of the course will be made available knowledge on carbohydrates, amino acids, proteins, lipids.

CO3. The students will understand definition and nature of enzymes and properties of enzymes.

CO4. The students will be acquainted with definition and types of secondary metabolites and will understand production of secondary metabolites via mevalonic and shikimic acid pathways.

PAPER III - BO 363- PLANT PATHOLOGY

CO1. The learners will be made acquainted with fundamentals of plant pathology, and important terminologies and significance.

CO2. The students will be having a wide exposure to various institutes working on such area, concept of disease cycle, disease development and its mechanism.

CO3. The students will be made versed with methods of studying plant diseases, fungal, bacterial, mycoplasma, nematodal, viral plant disease, non parasitic diseases.

CO4. The course will provide insights in principles of plant disease control and molecular diagnostics and transgenic in crop protection.

PAPER IV - BO 364 - EVOLUTION AND POPULATION GENETICS

CO1: After completing the course the student should understand and be able to explain fundamental terminology and concepts in the fields of genetics and evolution.

CO2: The student should have a good understanding of central concepts in population and quantitative genetics.

CO3: Student should also understand the basic scientific methods, including data analysis, used in these fields, and be able to carry out simple analyses using empirical population genetics and quantitative genetics data.

CO4: Students should be able to combine this knowledge to interpret results from studies in population and quantitative genetics.

CO5: The student should be capable of reflect on the outcome of genetic and evolutionary studies on a general level and evaluate their biological significance.

PAPER V- BO 365 - ADVANCED PLANT BIOTECHNOLOGY

CO1. The learner of the study will be introduced to biotechnology its history.

CO2. The students will be introduced to brief history and importance of plant tissue culture and its application

CO3. The learner of the course will be introduced to germplasm and cryopreservation strategies.

CO4. The students will be made available with information on transgenic plants as

bioreactors.

CO5. The learners of the course will be taught about non symbiotic nitrogen fixation, biological nitrogen fixation.

CO6. The students will be made versed with biotechnology and society.

CO7. The students will be introduced to bioinformatics and its scope and use in plant science. They will also be taught its application.

CO8. The learners will be introduces to methods, types, concepts and applications of genomics and proteomics.

PAPER VI - BO 366- PLANT BREEDING AND SEED TECHNOLOGY

CO1. The learner of the course will understand the scope and importance of plant breeding.

CO2. The student will be introduced to conventional techniques, methods and practices in breeding.

CO3. The students will be taught alternative breeding techniques, breeding for stress tolerance.

CO4. The students will be introduced to seed technology, stages of seed production and role of seed technology.

CO5. The learner of the course will be made understand seed certification, seed processing and seed sampling, storage and packaging.

CO6. The students will understand purity analysis of seeds, seed testing and seed marketing.

PAPER IX - BO 3610 - NURSERY AND GARDENING MANAGEMENT

CO1. Nursery management, nursery sites, preparation of sites, design and layout, producing plants from seed.

CO2. Learning of plants through vegetative propagation.

CO3. meethods of growing plants like polyhouse, greenhouse etc.

CO4.Gardening, pre-requisites of commercial gardening, harvesting and processing of flowers, commercial production of flowers.

PAPER X- BO 3611 - BIOFERTILIZERS

CO1. Learners will understand the importance of organic farming.

CO2. To study the use of biofertilizers in environment sustainability.

CO3. Learners will be aquainted with the types, functions and applications of biofertilizers.

CO4. To understand the large scale production of biofertilizers.

CO5. To understand the method of marketing, popularizing the biofertilizer technology.

5. MATHEMATICS

Preamble:

University of Pune has decided to change the syllabi of various faculties from June, 2019. Taking into consideration the rapid changes in science and technology and new approaches in different areas of mathematics and related subjects, Board of Studies in Mathematics with concern of the teachers of Mathematics from different colleges affiliated to University of Pune
has prepared the syllabus of T.Y.B.Sc. Mathematics. To develop the syllabus the U.G.C. Model
curriculum is followed.

DSE-1A: MT 351: METRIC SPACES (2 CREDITS)

Course Objectives: The course aims at providing the basic knowledge pertaining to metric spaces such as neighborhood, interior, closure, open and closed balls, continuity, completeness, compactness and connectedness etc.

Course Learning Outcomes: The course will enable the students to:
i) understand the introductory concepts of metric spaces;
ii) correlate these concepts to their counter parts in modern analysis by studying examples;
iii) learn to analyze mappings between spaces.
iv) attain background for advanced courses in real analysis, functional analysis, and topology.
v) appreciate the abstractness of the concepts such as open balls, closed balls, compactness, connectedness etc. beyond their geometrical imaginations.

DSE-1B: MT: 352 REAL ANALYSIS-I (2 CREDITS)

Course Objectives: The course will provide students with a thorough understanding of real lines and distinguishing concepts in order to prove convergence and divergence of real number sequences and series. These principles have a wide variety of real-world applications.

Course Learning Outcomes: This course will enable the students to:

i) learn the basic facts in logic and set theory

ii) learn to define sequence in terms of functions from N to a subset of R and to understand several properties of the real line.

iii) recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.

iv) use the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.

DSE-2A: MT-353: GROUP THEORY(2 CREDITS)

Course Objectives: The course objective is to introduce students to the fundamental theory of groups and their homomorphisms. Symmetric groups and symmetries in groups, Lagrange's theorem are also studied in depth.

Course Learning Outcomes: The course will enable the students to:

i) recognize the mathematical objects that are groups, and classify them as abelian, cyclic and permutation groups, etc;

ii) analyze consequences of Lagrange’s theorem

iii) learn about structure preserving maps between groups and their consequences.

iv) explain the significance of the notion of cosets, normal subgroups, and factor groups.

DSE-2B: MT-354- ORDINARY DIFFERENTIAL EQUATIONS (2 CREDITS)

Course Objectives: The main objectives of this course are to introduce the students to the exciting world of differential equations, system of differential equationsand their applications.

Course Learning Outcomes: The course will enable the students to:

i) understand the genesis of ordinary differential equations.

ii) learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order.

iii) grasp the concept of a general solution of a linear differential equation of an arbitrary order and also learn a few methods to obtain the general solution of such equations.

DSE-3A: MT 355(A): OPERATIONS RESEARCH (2 CREDITS)

Course Objectives: This course develops the ideas underlying the Simplex method for Linear programming problem, as an important branch of operations research. The course covers Linear programming with applications to Transportation and Assignment problem. Such problems arise in manufacturing resource planning and financial sectors.

Course Learning Outcomes: This course will enable the students to learn:

i) Analyze and solve linear programming models of real-life situations.

ii) The graphical solution of LPP with only two variables, and illustrate the concept of convex set and extreme points. The theory of the simplex method is developed.

iii) The relationships between the primal and dual problems and their solutions with applications to transportation, assignment and two-person zero-sum game problem.

DSE-3A: MT-355(B): DIFFERENTIAL GEOMETRY (2 CREDITS)

Course Objectives: This course enables the students to understand differential geometry of curves, their fundamental properties like torsion, curvature etc. along with their different forms. Also, to make understand different forms of curves and surfaces, along with their diverse properties through the use of differential calculus.

Course Learning Outcomes: The course will enable the students to:

i) Gain an understanding to solve problems with the use of differential geometry to diverse situations in mathematical contexts.

ii) Develop different properties associated with curves and surfaces.

iii) Demonstrate a depth of understanding in advanced mathematical topics in relation to geometry of curves and surfaces Learn to analyze mappings between spaces.

iv) Apply the theory of differential geometry to specific research problems in mathematics or other fields.

DSE-3A: MT 355(C): C-PROGRAMMING (2 CREDITS)

Course Objectives: The **course** is designed to provide complete knowledge of **C-language**. Students will be able to develop logics which will help them to create **programs**, applications in **C**. Also, by **learning** the basic **programming** constructs they can easily switch over to any

other **language** in future.

Course Learning Outcomes: After the completion of this course, the students will be able to develop applications.

DSE-3B: MT-356(A): MACHINE LEARNING-I (2 CREDITS)

Course Objectives:

Students will try to learn:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To become familiar with **introduction to NumPy Array and Matrices**.
3. To become familiar with discover and visualize data to gain insights.
4. To become familiar with Fine-tuning the model - Grid Search, Randomized Search.
5. To develop the ability to write database applications in Python.

Course Learning Outcomes:

Upon successful completion of this course the student will be able to:

1. Gain knowledge about basic concepts of Machine Learning.
2. Identify machine learning techniques suitable for a given problem.
3. Solve the problems using various machine learning techniques.

DSE-3B: MT-356(B): NUMBER THEORY (2 CREDITS)

Course Objectives: There are difficult open problems in number theory that are understandable at the undergraduate level; this course is designed to develop a micro aptitude for understanding the aesthetic aspect of mathematical instructions and to prepare young minds to ponder such problems. Another goal is to familiarise students with basic number theoretic techniques that can be used in data protection.

Course Learning Outcomes: This course will enable the students to learn:

i) some of the open problems related to prime numbers.

ii) about number theoretic functions and modular arithmetic.

iii) the Law of Quadratic Reciprocity and other methods to classify numbers as primitive roots, quadratic residues, and quadratic non-residues.

DSE-3B: MT-356 (C): Laplace Transform and Fourier Series (2 credits)

Course Objectives: The main objective of this course is to determine properties of Laplace Transform and Fourier series which may be solved by application of special functions.

Course Learning Outcomes: This course will enable the students to learn:

i) Students will be able to know the use of Laplace transform in system modeling, digital signal processing, process control.

ii) Solve an initial value problem for an nth order ordinary differential equation using the Laplace transform.

iii) Find the Fourier series representation of a function of one variable

SEC-I: MT -3510: PROGRAMMING IN PYTHON–I (2 CREDITS)

Course Objectives:

1. To understand why **Python** is a useful scripting language for developers.
2. To learn how to use lists, tuples, and dictionaries in **Python** programs.
3. To learn and understand python looping, control statements and string manipulations.
4. To acquire programming skills in core Python.

Course Learning Outcomes: At the end of the course:

1. The student will be able to explain basic principles of Python programming language.
2. The student will implement object oriented concepts.

SEC-II: MT-3511: LATEX FOR SCIENTIFIC WRITING (2 CREDITS)

Course Objectives: The purpose of this course is

i) To provide an understanding of the basicmechanisms of LaTeX, using plain text as a vehicle

ii) To acquaint students with the latest typesetting skills, which shall enable them to prepare high quality typesetting.

Course Learning Outcomes: After studying this course the student will be able to:

i) Write a simple LaTeX input document based on the article class.

ii) Turn the input document into pdf with the pdflatex program.

iii) Format Words, Lines, and Paragraphs.

iv) Understand how to present data using tables.

Semester-VI

DSE-4A: MT - 361: COMPLEX ANALYSIS (2 CREDITS)

Course Objectives: This course aims to introduce the basic ideas of analysis for complex functions in complex variables with visualization through relevant Practicals. Particular emphasis has been laid on Cauchy's theorems, series expansions and calculation of residues.

Course Learning Outcomes: The completion of the course will enable the students to:

i) Understand the significance of differentiability of complex functions leading to the understanding of Cauchy-Riemann equations.

ii) Evaluate the contour integrals and understand the role of Cauchy-Goursat theorem and the Cauchy integral formula.

iii) 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.

iv) Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem.

DSE-4B: MT: 362 REAL ANALYSIS-II(2 CREDITS)

Course Objectives: To comprehend bounded function integration on a closed and bounded interval, as well as its extension to situations where either the integration interval is infinite or the integrand has infinite limits at a finite number of points on the integration interval. The sequence and series of real-valued functions.

Course Learning Outcomes: The course will enable the students to learn about:

i) some of the families and properties of Riemann integrable functions, and the applications of the fundamental theorems of integration.

ii) beta and gamma functions and their properties.

iii) recognize the difference between pointwise and uniform convergence of a sequence

of functions.

iv) illustrate the effect of uniform convergence on the limit function with respect to continuity, differentiability, and integrability.

DSE-5A: MT: 363 RING THEORY (2 CREDITS)

Course Objectives: The objective of this course is to introduce the fundamental theory of rings and their corresponding homomorphisms. The basic concepts of ring of polynomials and irreducibility tests for polynomials over ring of integers.

Course Learning Outcomes: The course will enable the students to learn about:

i) The fundamental concept of Rings, Fields, subrings, integral domains and the corresponding morphisms.

ii) Learn in detail about polynomial rings, fundamental properties of finite field extensions, and classification of finite fields.

iii) Appreciate the significance of unique factorization in rings and integral domains.

DSE-5B: MT 364: PARTIAL DIFFERENTIAL EQUATIONS (2 CREDITS)

Course Objectives: The main goals of this course are to teach students how to form, solve, and apply partial differential equations to solve physical problems. Also, to introduce first and second order partial differential equations and their classifications and methods of finding solutions of these partial differential equations.

Course Learning Outcomes: The course will enable the students to:

i) formulate, classify and transform partial differential equations into canonical form.

ii) solve linear partial differential equations using various methods and apply these methods in solving some physical problems.

iii) solve Laplace equations using various analytical methods demonstrate uniqueness of solutions of certain kinds of these equations.

DSE-6A: MT365 (A): OPTIMIZATION TECHNIQUES (2 CREDITS)

Course Objectives: This course enables the students to get an idea about the

i) Network and basic components, Determination of critical path: Critical Path Method (CPM),Project Evaluation and Review Techniques(PERT).Time-cost optimization Algorithm.

ii) Problem of Sequencing, Processing n Jobs through Two Machines, Processing n Jobs through 3 Machines and Processing n Jobs through k Machines.

Course Learning Outcomes: The course will enable the students to:

i) understand fundamentals of Network Analysis using CPM and PERT.

ii) solve a sequencing Problem for various jobs and machines.

DSE-6A: MT 365(B): CALCULUS OF VARIATION AND CLASSICAL MECHANICS (2 CREDITS)

Course Objectives: Using mathematical methods, the course seeks to comprehend various definitions of physical quantities and their effects on various bodies. It stresses the acquisition of knowledge in order to apply mathematics to the real world.

Course Learning Outcomes: The course will enable the students to:

i) understand problems, methods and techniques of calculus of variations.

ii) understand necessary conditions for the equilibrium of particles acted upon by various forces and learn the principle of virtual work for a system of coplanar forces acting on a rigid body.

iii) deal with the kinematics and kinetics of the rectilinear and planar motions of a particle including the constrained oscillatory motions of particles.

iv) determine the center of gravity of some materialistic systems and discuss the equilibrium of a uniform cable hanging freely under its own weight.

DSE-6A: MT 365 (C): FINANCIAL MATHEMATICS (2 CREDITS)

Course Objectives:

This course enables the students to understand the basic securities, organization of financial markets, the concept of interest rates, present and future value of cash flow.

Course Learning Outcomes: The course will enable the students to:

i) describe and explain the fundamental features of a financial instruments.

ii) demonstrate a clear understanding of financial research planning, methodology and implementation.

iii) demonstrate understanding of basic concepts in linear algebra, relating to linear equations, matrices, and optimization.

iv) demonstrate understanding of concepts relating to functions and annuities.

DSE-6B: MT-366(A): MACHINE LEARNING-II (2 CREDITS)

Course Objectives:

The main goal of this course is to help students learn, understand, and practice machine learning approaches, which include the study of modern computing big data technologies and scaling up machine learning techniques focusing on industry applications.

Course Learning Outcomes:

The students learning outcomes are designed to specify what the students will be able to perform after completion of the course: Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.

DSE-6B: MT- 366(B): COMPUTATIONAL GEOMETRY (2 CREDITS)

Course Objectives: This course enables the students to gain detailed knowledge of the fundamental problems within computation geometry and general techniques for solving problems within computational geometry and practical experience with implementation issues involved in converting computation geometry algorithms into running programs.

Course Learning Outcomes: The course will enable the students to:

v) construct algorithms for simple geometrical problems.

vi) characterize invariance properties of Euclidean geometry by groups of transformations.

vii) describe and construct basic geometric shapes and concepts by computational means.

DSE-6B: MT-366(C): LEBESGUE INTEGRATION (2 CREDITS)

Course Objectives: To develop skills and to acquire knowledge on basic concepts of Lebesgue Measure, The Lebesgue Integral, Measurable Functions, Convergence and completeness.

Course Learning Outcomes: The course will enable the students:

i) To understand the concept of measure and properties of Lebesgue measure.

ii) To study the properties of Lebesgue integral and compare it with Riemann integral.

SEC-III: MT-3610: PROGRAMMING IN PYTHON –II(2 CREDITS)

Course Objectives:

1. To acquire Object Oriented Skills in Python.
2. To develop the skill of designing Graphical user Interfaces in Python.
3. To learn and understand Python programming basics and paradigm.
4. To learn the concepts of visualization of data and database connectivity.
5. To develop the ability to write database applications in Python.

Course Learning Outcomes:

Upon successful completion of this course the student will be able to:

1. Demonstrate the use of Python in Mathematics such as operations research and computational Geometry etc.
2. Study graphics and design and implement a program to solve a real world problem.
3. The students will implement the concepts of data with python and database connectivity.

SEC-IV: MT-3611: MATHEMATICS INTO LATEX (2 CREDITS)

Course Objectives: The purpose of this course is to acquaint students with typesetting basic Mathematics in LaTeX.

Course Learning Outcomes: After studying this course the student will be able to:

i) typeset mathematical formulas, use nested list, tabular and array environments.

ii) import figures and pictures that are stored in external files.

BACHLOR OF COMPUTER SCIENCE

(B.Sc. COMPUTER SCIENCE)

BACHLOR OF COMPUTER APPLICATIONS

BACHELOR OF COMPUTER APPLICATIONS

SEMESTER V

BCA 351: DSE I (PROGRAMMING IN JAVA)

Course Objectives:

- To learn implementation of object-oriented conceptswith Java.
- To understand collection classes and interfaces.
- To know the process of application development using Graphical User Interface (GUI).
- To acquire knowledge about handling databases using Java.
- To study web components for developing web applications.

Course Outcomes:

After successful completion of this course, learner will be able to:

- Identify classes, objects, class members and relationships for a given problem.
- Design end to end applications using object oriented constructs.
- Apply collection classes for storing java objects.
- Use Java APIs for program development.
- Handle abnormal termination of a program using exception handling.

BCA 352: DSE II - DATA MINING AND DATA SCIENCE

Course Objectives:

- To introduce students to the basic concepts and techniques of Data Mining and Data Science
- To study data mining algorithms for solving practical problems.
- To understand data visualization and exploratory analysis.

Course Outcomes:

After successful completion of this course, learner will be able to:

- Identify the key processes of data mining, data warehousing and knowledge discovery
- Design data warehouse with dimensional modeling and apply OLAP operations.
- Identify appropriate data mining algorithms to solve real world problems

● Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining

● Choose an appropriate method to perform exploratory analysis.

● Interpret results by carrying out data visualization and formal inference procedures

BCA 353: DSE III (PRINCIPLES OF OPERATING SYSTEMS)

Course Objectives:

● To study algorithms for CPU-scheduling, process creation and termination.

● To understand the notion of a Multithreading and Inter-process communication.

● To learn critical-section problems and classical process-synchronization problems.

● To know the concept of deadlock, different methods for preventing or avoiding deadlocks and techniques for memory management.

● To learn and understand file system, directory structure, file allocation methods and disk scheduling algorithms.

Course Outcomes:

After successful completion of this course, learner will be able to:

● Describe algorithms for process, memory and disk scheduling

● Apply technique for inter-process communication and Multithreading.

● Implement concept of critical-section

● Compare and contrast deadlock avoidance and

BCA354: ARTIFICIAL INTELLIGENCE

Course Objectives:

● To learn various types of algorithms useful in Artificial Intelligence (AI).

● To convey the ideas in AI research related to emerging technology.

● To introduce ideas and techniques underlying the design of intelligent computer systems

Course Outcomes:

After successful completion of this course, learner will be able to:

● Apply the suitable algorithms to solve AI problems

● Identify and apply suitable Intelligent agents for various AI applications

● Build smart system using different informed search / uninformed search or heuristic approaches

● Represent complex problems with expressive language of representation

BCA 355: SEC II (CLOUD COMPUTING)

Course Objectives:

● To study cloud computing concepts, technologies, architecture and applications.

● To understand issues in application deployment and implementations in cloud environment.

● To learn recent trends in cloud computing.

Course Outcomes:

After successful completion of this course, learner will be able to:

● Explain the core issues in cloud computing such as security, privacy, and interoperability.

● Choose the appropriate technologies, algorithms, and approaches for the given application.

● Compare and contrast various cloud services

BCA356: DSE I LABORATORY (PROGRAMMING IN JAVA)

Course Objectives:

● To learn implementation of object-oriented concepts with Java.

● To understand collection classes and interfaces.

● To know the process of application development using Graphical User Interface (GUI).

● To acquire knowledge about handling databases using Java.

● To study web components for developing web applications.

Course Outcomes:

After Completion of this course, students will able to

● Identify classes, objects, class members and relationships for a given problem.

● Design end to end applications using object oriented constructs.

● Apply collection classes for storing java objects.

● Use Java APIs for program development.

● Handle abnormal termination of a program using exception handling.

BCA357: DSE II LABORATORY (DATA MINING)

Course Objectives:

- To understand the basics of R programming
- To study facilities for performing data mining with R packages
- To learn python functionalities and features used for data mining
- To explore Data analysis and Data Visualization using Python

Course Outcomes: After completion of this course, students will able to

- Implement data mining tasks using R
- Use the python packages to carry out data mining tasks.
- Perform data analysis and data visualization using python packages.

BCA 358: DSE III LABORATORY (OPERATING SYSTEMS AND AI)

Course Objectives:

- To study the process management and scheduling.
- To Study Memory Management
- To study and understand searching techniques

Course Outcomes:

After successful completion of this course, learner will be able to:

- Implement algorithms for Process scheduling and Memory management
- Describe process synchronization and multithreading
- Compare and contrast the algorithms for memory management and its allocation policies.
- Use searching algorithms
- Design a simple Expert system

Semester VI

BCA 361: ANDROID PROGRAMMING

Course Objectives:

- To understand the Android Operating System
- To study Android Apps Development Cycle
- To learn to create Android Applications.

Course Outcomes:

After successful completion of this course, learner will be able to:

- Describe the process of developing mobile applications.
- Create mobile applications on the Android Platform.
- Design and implement mobile applications involving data storage in SQLite database
- Use location-based services while developing applications

BCA 362: DSE-V PROGRAMMING IN GO

Course Objectives:

- To study various programming constructs in GO
- To understand salient features in GO
- To know advance features in GO

Course Outcomes:

After successful completion of this course, learner will be able to:

- Describe the core features and concepts in Go
- Write simple Go programs using functions
- Apply defining methods and Go Interfaces
- Use Go routines and Channels
- Explore Go Packages

BCA 363: DSE VI SOFTWARE PROJECT MANAGEMENT

Course Objectives:

- To understand the fundamentals of Software Project Management
- To introduce Software project planning and management tools
- To study software project scheduling and tracking
- To know the agile project management
- To learn managing people in software project

Course Outcomes:

On Successful completion of the course, learners should be able to

 Comprehend Software Project Management Concepts

 Use various tools for Software Project Management Schedule various activities in software projects

 Track a project and manage changes

 Apply Agile Project Management concepts

 Analyze staffing process for team building and decision making

BCA364: SEC III MANAGEMENT INFORMATION SYSTEM

Course Objectives:

 To know the role of information technology and decision support systems in business model.

 To learn the fundamental principles of information systems

 To understand the principles and techniques used for management and decision making

 To explore various applications of MIS

Course Outcomes:

After successful completion of this course, learners will able to

 Describe MIS, BPR, EMS

 Compare MIS with BPR, DSS and EMS

 Identify various ERP modules for a given application

 List the applications of MIS in Manufacturing and service sectors

BCA365: SEC IV INTERNET OF THINGS (IOT)

Course Objectives:

- To understand fundamentals of Internet of Things (IoT) and Embedded Systems
- To know methodologies for IoT application development
- To study the IoT protocols, cloud platforms and security issues in IoT
- To learn real world application scenarios of IoT along with its societal and economic impact

Course Outcomes:

On successful completion of the course, learners should be able to

 Define Embedded Systems and the Internet of Things

- Apply enabling technologies for developing IoT systems
- Design simple IoT applications
- Analyze protocols for communication among IoT devices
- Describe cloud-based IoT systems
- Comprehend security issues in IoT applications

BCA366: DSE IV LABORATORY (ANDROID PROGRAMMING)

Course Objectives:

- To understand the Android Operating System and
- To study Android Apps Development Cycle
- To learn to create Android Applications.

Course Outcomes:

After completion of this course, students will able to

- Describe the process of developing mobile applications.
- Create mobile applications on the Android Platform.
- Design and implement mobile applications involving data storage in SQLite database
- Use location-based services while developing applications

BCA367: DSE V LABORATORY (PROGRAMMING IN GO AND IOT)

Course Objectives:

- To introduce essential programming features in GO
- To become familiar with programming techniques in GO
- To understand the technique of building Packages and File handling
- To learn developing simple IoT applications

Course Outcomes:

On completion of this course, students will be able to:

- Write programs using features supported in GO
- Handle errors and utilize Goroutines and Channels
- Write programs on File handling
- Compare and contrast features of GO with other object oriented languages
- Design Simple IoT application

BCA368: DSE VI PROJECT LABORATORY

Course Objectives:

1. To understand concepts of Project Management
2. To know how various tools for development and management of software projects are used to carry out various tasks involved
3. To learn the importance of project documentation

Course Outcomes:

After completion of this course, learners will able to

1. Demonstrate a sound technical knowledge of selected project topic.
2. Apply techniques for project management
3. Create various documents used during the development of the project and a project report

T.Y.B.SC. (COMPUTER SCIENCE) - SEM – V

COURSE TYPE: DSEC – I COURSE CODE : CS - 351 COURSE TITLE : OPERATING SYSTEMS – I

Course Objectives:

1. To understand the concept of operation system and its principle

2. To study the various functions and services provided by operating system

3. To understand the notion of process and threads

Course Outcomes: After completion of this course students will be able to understand the concept of

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

COURSE CODE: DSEC - I COURSE CODE : CS - 352 COURSE TITLE :COMPUTER NETWORKS - II

Course Objectives

 To understand different protocols of application layer.

 To understand concepts of multimedia.

 Explore the different methods used for Network/INTERNET security.

Course Outcomes

On completion of the course, student will be able to–

 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.

 Understand, compare and apply cryptographic techniques for data security.

COURSE TYPE:DSEC – II COURSE CODE: CS - 353 COURSE TITLE : WEB TECHNOLOGIES - I

Course Objectives

 To Design dynamic and interactive Web pages.

 To Learn Core-PHP, Server Side Scripting Language

 To Learn PHP-Database handling

Course Outcomes

On completion of the course, student will be able to–

 Understand how to develop dynamic and interactive Web Page

COURSE TYPE:DSEC – II COURSE CODE: CS - 354

Paper Title : Foundations of Data Science

Course Objectives

 Provide students with knowledge and skills for data-intensive problem solving and scientific discovery

 Be prepared with a varied range of expertise in different aspects of data science such as data collection, visualization, processing and modeling of large data sets.

 Acquire good understanding of both the theory and application of applied statistics and computer science based existing data science models to analyze huge data sets originating from diversified application areas.

 Be better trained professionals to cater the growing demand for data scientists in industry.

Course Outcomes

On completion of the course, student will be able to–

 Perform Exploratory Data Analysis

 Obtain, clean/process, and transform data.

 Detect and diagnose common data issues, such as missing values, special values, outliers, inconsistencies, and localization.

 Demonstrate proficiency with statistical analysis of data.

 Present results using data visualization techniques.

 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.

COURSE TYPE:DSEC – III COURSE CODE: CS - 355 COURSE TITLE: OBJECT ORIENTED PROGRAMMING USING JAVA - I

Course Objectives

 To learn Object Oriented Programming language

 To study various java programming concept like Interface, File and Exception Handling etc.

 To design User Interface using Swing and AWT

Course Outcomes

On completion of the course, student will be able to–

 Understand the concept of classes, object, packages and Collections.

 To develop GUI based application.

COURSE TYPE: DSEC - III COURSE CODE: CS - 356 PAPER TITLE: THEORETICAL COMPUTER SCIENCE

Course Objectives

- To understand the Finite Automata, Pushdown Automata and Turing Machine.
- To understand the Regular Language, Context Free Language, Context Sensitive Language and Unrestricted Language.
- To understand the relation between Automaton and Language

Course Outcomes

On completion of the course, student will be able to–

- Understand the use of automata during language design.
- Relate various automata and Languages.

COURSE TYPE: DSEC - I COURSE CODE: CS - 357 COURSE TITLE : PRACTICAL COURSE BASED ON CS - 351

Course Objectives:

1. To understand the concept of process scheduling with the help of simulation.
2. To study the concept demand paging concepts in operating system.

3. To understand the working of operating system shell.

Course Outcomes: After completion of this course students will be able to understand the concept of

1. Process synchronization
2. Processes and Thread Scheduling by operating system
3. Memory management by operating system using with the help of various schemes

COURSE TYPE: DSEC - II COURSE CODE: CS - 358

Course Title : Practical Course based on CS - 353 and CS - 354

Course Objectives:

- To Design dynamic and interactive Web pages.
- To Learn Core-PHP, Server Side Scripting Language
- To Learn PHP- Database handling
- To apply statistical, data preprocessing and visualization techniques on data sets

Course Outcomes:

- 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

COURSE TYPE: DSEC - III COURSE CODE: CS - 359 COURSE TITLE : PRACTICAL COURSE BASED ON CS - 355

Course Objectives:

Covers the complete scope of the syllabus.

1. Bringing uniformity in the way course is conducted across different colleges.
2. Continuous assessment of the students.

Course Outcomes:

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.

COURSE TYPE: SECC – I COURSE CODE : CS-3510 COURSE TITLE: PYTHON PROGRAMMING

Course Objectives

1. To introduce programming concepts using python
2. Student should be able to develop Programming logic using python
3. To develop basic concepts and terminology of python programming
4. To test and execute python programs

Course Outcomes

On completion of the course, student will be able to–

 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 project

COURSE TYPE: SECC – II COURSE CODE : CS-3511 COURSE TITLE: BLOCKCHAIN TECHNOLOGY

Course Objectives

1. Understand what and why of blockchain technology.
2. Explore major components of blockchain.
3. Learn about Bitcoin, Cryptocurrency and Ethereum.
4. To learn blockchain programming using Python, Flask Web Framework, and HTTP client Postman.

Course Outcomes

On completion of the course, student will be able to–

1. Learn the fundamentals of Blockchain Technology.
2. Learn Blockchain programming

3. Basic knowledge of Smart Contracts and how they function

COURSE TYPE: DSEC - IV COURSE CODE: CS - 361 COURSE TITLE : OPERATING SYSTEMS-II

Course Objectives:

1. To understand the issue of Deadlocks in Process management.
2. To understand the concept of File system management & disk scheduling
3. To study the concept of distributed and mobile operating systems

Course Outcomes: After completion of this course students will be able to understand the concept of

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.

COURSE TYPE: DSEC - IV COURSE CODE: CS - 362 COURSE TITLE : SOFTWARE TESTING

Course Objectives:

 To provide the knowledge of software testing techniques

 To understand how testing methods can be used as an effective tools in quality assurance of software.

 To provide skills to design test case plan for testing software.

 To provide knowledge of latest testing methods

Course Outcomes:

 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.

 4. To understand latest testing methods used in the software industries.

COURSE TYPE: DSEC – V COURSE CODE: CS - 363 COURSE TITLE : WEB TECHNOLOGIES - II

Course Objectives

• To Learn different technologies used at client Side Scripting Language

• To Learn XML and XML parsers.

• To One PHP framework for effective design of web application.

• To Learn Java Script to program the behavior of web pages.

• To Learn AJAX to make our application more dynamic.

• Framework has

Course Outcomes

On completion of the course, student will be able to–

• Build dynamic website.

• Using MVC based framework easy to design and handling the errors in dynamic website.

COURSE TYPE:DSEC – V COURSE CODE: CS - 364

Course Title : Data Analytics

Course Objectives

 Deploy the Data Analytics Lifecycle to address data analytics projects.

 Develop in depth understanding of the key technologies in data analytics.

 Apply appropriate analytic techniques and tools to analyze data, create models, and identify insights that can lead to actionable results.

Course Outcomes

On completion of the course, student will be able to–

 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

COURSE TYPE: DSEC – VI COURSE CODE : CS - 365 COURSE TITLE : OBJECT ORIENTED PROGRAMMING USING JAVA – II

Course Objectives

 To learn database programming using Java

 To study web development concept using Servlet and JSP

 To develop a game application using multithreading

 To learn socket programming concept

Course Outcomes

On completion of the course, student will be able to–

 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.

COURSE TYPE: DSEC - VI COURSE CODE: CS - 366 COURSE TITLE: COMPILER CONSTRUCTION

Course Objectives

- To understand design issues of a lexical analyzer and use of LEX tool.
- To understand design issues of a parser and use of YACC tool.
- To understand and design code generation and optimization techniques.

Course Outcomes

On completion of the course, student will be able to–

- 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.

COURSE TYPE: DSEC- IV COURSE CODE: CS - 367 COURSE TITLE : PRACTICAL COURSE BASED ON CS - 361

Course Objectives:

1. To implement Banker's algorithm for Deadlocks in Process management.
2. To simulate File system management
3. To study and implement various algorithms of disk scheduling

Course Outcomes: After completion of this course students will be able to understand the concept of

1. Management of deadlocks by operating system
2. File System management
3. Disk space management and scheduling for processes

COURSE TYPE: DSEC - V COURSE CODE: CS - 368 COURSE TITLE : PRACTICAL COURSE BASED ON CS - 363 AND CS - 364

Course Objectives:

- To Learn different technologies used at client Side Scripting Language
- To Learn XML and XML parsers.
- To One PHP framework for effective design of web application.
- To Learn Java Script to program the behavior of web pages.
- To Learn AJAX to make our application more dynamic.

Framework has some utility features that make easy to write API in more efficient way than Core PHP

Course Outcomes:

- Build dynamic website.
- Using MVC based framework easy to design and handling the errors in dynamic website.

COURSE TYPE: DSEC - VI COURSE CODE: CS - 369 COURSE TITLE : PRACTICAL COURSE BASED ON CS - 365

Course Objectives:

1. Covers the complete scope of the syllabus.

2. Bringing uniformity in the way course is conducted across different colleges.

3. Continuous assessment of the students.

4. Advanced Java is designed to develop web based, network centric, Enterprise level applications

Course Outcomes:

1. To Learn database Programming using Java

2. Understand and Create dynamic web pagesusing Servlets and JSP.

3. Work with basics of framework to develop secure web applications

COURSE TYPE: SECC - III COURSE CODE: CS - 3610 COURSE TITLE: SOFTWARE TESTING TOOLS

Course Objectives:

 To provide the knowledge of software testing methods and strategies.

 To understand how testing methods can be used as an effective tool in quality assurance of software.

 To provide skills to design test case plan for testing software.

 4.To provide knowledge of latest testing tools

Course Outcomes:

 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.

 4. To understand latest testing tools used in the software industries.

COURSE TYPE: SECC - IV COURSE CODE: CS - 3611 COURSE TITLE : PROJECT

Project Guidelines:

 Students should work in a team of minimum 3 and maximum 4 students.

 Students can choose a project topic and implement the same using any language/technology covered in the curriculum so far. The operating environment must be linux.

 The student group will work independently throughout the project work including: problem identification, information searching, literature study, design and analysis, implementation, testing, and the final reporting.

 Project guide must conduct project presentations (minimum 2) to monitor the progress of the project groups.

 At the end of the project, the group should prepare a report which should conform to international academic standards. The report should follow the style in academic journals and books, with clear elements such as: abstract, background, aim, design and implementation, testing, conclusion and full references, Tables and figures should be numbered and referenced to in the report.

 The final project presentation with demonstration (UE) will be evaluated by the project guide (appointed by the college) and one external examiner (appointed by the University).

ARTS FACULTY

1. MARATHI

तृतीय वर्ष कला (T. Y. B. A.)

नियमित अभ्यासक्रम

पहिले सत्र

विषयाचे नाव

भाषिक कौशल्यविकास आणि आधुनिक मराठी साहित्यप्रकार : प्रवासवर्णन [CC – 1 E (3)]

अभ्यासक्रमाची उद्दिष्टे :

१ मुद्रित माध्यमांसाठी लेखन कौशल्ये आत्मसात करणे.
२ प्रवासवर्णन या साहित्यप्रकाराचे स्वरूप, प्रेरणा, प्रयोजने, वैशिष्ट्ये आणि वाटचाल समजून घेणे.
३ नेमलेल्या प्रवासवर्णनाचे आकलन,आस्वाद आणि विश्लेषण करणे.

दुसरे सत्र

विषयाचे नाव

भाषिक कौशल्यविकास आणि आधुनिक मराठी साहित्यप्रकार : कविता [CC – 1 F (3)]

अभ्यासक्रमाची उद्दिष्टे :

१. मराठी साहित्य, भाषिक कौशल्यविकास आणि शासनव्यवहार यांची माहिती घेणे.
२. कविता या साहित्यप्रकाराचे स्वरूप, वाटचाल, प्रेरणा, प्रवृत्ती आणि वैशिष्ट्ये,समजून घेणे.
३. नेमलेल्या अभ्यासपुस्तकातील निवडक कवितांचे आकलन, आस्वाद आणि विश्लेषण करणे.
४. कविता या साहित्यप्रकारातील विविध आविष्कार व भाषा रूपांची अभ्यासपुस्तकातील कवितांच्या आधारे ओळख करून घेणे.

तृतीय वर्ष कला (T. Y. B. A.)

नियमित अभ्यासक्रम

पहिले सत्र

विषयाचे नाव

व्यावहारिक व उपयोजित मराठी - भाग ५ [CC – 1 E (3)]

अभ्यासक्रमाची उद्दिष्टे :

१ संभाषणविषयक भाषिक कौशल्ये आत्मसात करणे.
२ वृत्तपत्रविषयक भाषिक कौशल्ये आत्मसात करणे.
३ मराठी साहित्य, भाषिक कौशल्यविकास आणि शासनव्यवहार यांची माहिती घेणे.

दुसरे सत्र

विषयाचे नाव

व्यावहारिक व उपयोजित मराठी - भाग ६ [CC – 1 F (3)]

अभ्यासक्रमाची उद्दिष्टे :

१. भाषाविषयक उपयोजित लेखन क्षमता विकसित करणे.
२. विविध माध्यमे आणि नवसमाजमाध्यमांतील विविध भाषिक आविष्कारांचे स्वरूप समजून घेणे.
३. विविध माध्यमे आणि नवसमाजमाध्यमांसाठी लेखन क्षमता विकसित करणे.

तृतीय वर्ष कला (T. Y. B. A.)

नियमित अभ्यासक्रम

पहिले सत्र

विषयाचे नाव

मध्ययुगीन मराठी वाङ्मयाचा स्थूल इतिहास : प्रारंभ ते इ.स. १६०० [DSE 1 C (3+1)]

अभ्यासक्रमाची उद्दिष्टे :

१ वाङ्मयेतिहास संकल्पना, स्वरूप, प्रेरणा, प्रवृत्ती समजून घेणे.
२ मध्ययुगीन कालखंडाची सामाजिक, सांस्कृतिक पार्श्वभूमी समजून घेणे.
३ मराठी भाषा, साहित्याची कालखंडानुरूप इतिहास समजून घेणे.

तृतीय वर्ष कला (T. Y. B. A.)

नियमित अभ्यासक्रम

पहिले सत्र

विषयाचे नाव

वर्णनात्मक भाषाविज्ञान : भाग १ [DSE 2 C (3)+1]

अभ्यासक्रमाची उद्दिष्टे :

१ भाषा स्वरूप, वैशिष्ट्ये व कार्ये समजावून घेणे.
२ भाषा अभ्यासाची आवश्यकता स्पष्ट करणे.
३ भाषा अभ्यासाच्या शाखा आणि विविध पद्धतींचा थोडक्यात परिचय करून घेणे.
४ वागिन्द्रियाची रचना, कार्य आणि स्वननिर्मितीची प्रक्रिया समजावून घेणे.
५ स्वनविज्ञान, स्वनिमविचार आणि मराठीची स्वनिमव्यवस्था समजावून घेणे.

दुसरे सत्र

विषयाचे नाव

वर्णनात्मक भाषाविज्ञान : भाग २ - ४ [DSE 2 D (3)+1]

अभ्यासक्रमाची उद्दिष्टे :

१. रूपविन्यास आणि मराठीची रूपव्यवस्था समजावून घेणे
२. वाक्यविन्यास आणि वाक्यव्यवस्थेचा मराठी भाषेच्यासंदर्भात परिचय करून देणे
३. अर्थविन्यास या संकल्पनेचा भाषावैज्ञानिक अंगाने परिचय करून देणे

तृतीय वर्ष कला (T. Y. B. A.)

नियमित अभ्यासक्रम

पहिले सत्र

विषयाचे नाव

कार्यक्रम संयोजनातील भाषिक कौशल्ये : भाग -१ [SEC 2 C (2)]

अभ्यासक्रमाची उद्दिष्टे :

१ कार्यक्रमांचे स्वरूप आणि प्रकार समजून घेणे.
२ कार्यक्रम संयोजनातील भाषिक कौशल्ये प्राप्त करणे.

दुसरे सत्र

विषयाचे नाव

कार्यक्रम संयोजनातील भाषिक कौशल्ये : भाग २ [SEC 2 D (2)]

अभ्यासक्रमाची उद्दिष्टे :

१ कार्यक्रम संयोजनातील लेखन कौशल्ये संपादन करणे.
२ कार्यक्रम संयोजनातील भाषिक कौशल्ये प्राप्त करणे.
३ आभासी कार्यक्रमांचे भाषिक कौशल्ये संयोजन करणे.

2. HINDI

बी. ए. तृतीय वर्ष कला (शैक्षिक वर्ष 2021–2022 से)

पंचम अयन **(Fifth Semester)**

पाठ्यचर्या : **Core Course – 1E (G3)** पाठ्यचर्या : कथेतर विधाएँ

3 कर्मांक **(3 Credit)**

उद्देश्य :

1. छात्रों को संस्मरण साहित्य से अवगत करना।
2. छात्रों को रेखाचित्र साहित्य से अवगत करना।
3. छात्रों को मूल्यांकन की दृष्टि का विकास करना।
4. सभा–इतिवृत्त लेखन कौशल वृद्धि का विकास करना।
5. वार्ता–लेखन कौशल दृष्टि निर्माण करना।

बी. ए. तृतीय वर्ष कला (शैक्षिक वर्ष 2021–2022 से)

पंचम अयन **(Fifth Semester)** वैकल्पिक

पाठ्यचर्या : **Core Course – 1E (G3)** वैकल्पिक पाठ्यचर्या : प्रयोजनमूलक हिंदी कार्यालयीन व्यवहार

3 कर्मांक **(3 Credit)**

उद्देश्य :

1. छात्रों को कार्यालयीन कार्यपद्धति की जानकारी देना।
2. छात्रों को सरकारी पत्राचार के प्रकारों, स्वरूप, भाषा शैली आदि की जानकारी देना।
3. छात्रों को क्षेत्र–कार्य प्रणाली से परिचित कराना।
4. छात्रों को राजभाषा हिंदी का संवैधानिक प्रावधान, हिंदी प्रचार प्रसार कार्य से परिचित करना।
5. छात्रों को अनुवाद प्रक्रिया से अवगत कराना।

बी. ए. तृतीय वर्ष कला (शैक्षिक वर्ष 2021–2022 से)

षष्ठ अयन **(Sixth Semester)** वैकल्पिक

पाठ्यचर्या : **Core Course – 1F (G3)** वैकल्पिक पाठ्यचर्या – प्रयोजनमूलक हिंदी : माध्यम लेखन

3 कर्मांक **(3 Credit)**

उद्देश्य :

1. छात्रों को जनसंचार माध्यम और हिंदी अवधारणा से परिचित करना।
2. छात्रों को पृष्ठ सज्जा के विविध अंगों से परिचित कराना।
3. छात्रों को संचार क्रांति और सूचना प्रोद्योगिकी से अवगत कराना।
4. छात्रों को भिन्न–भिन्न क्षेत्रों में सूचना प्रोद्योगिकी की उपादेयता से अवगत कराना।

बी. ए. तृतीय वर्ष कला (शैक्षिक वर्ष 2021–2022 से)

पंचम अयन **(Fifth Semester)**

पाठ्यचर्या : **Discipline Specific Elective 1 C (S3)** हिंदी साहित्य का इतिहास (आदिकाल, भक्तिकाल, रीतिकाल का सामान्य परिचय) 3 कर्मांक **(3 Credit) + 1***

उद्देश्य :

1. हिंदी साहित्येतिहास लेखन का परिचय देना।
2. हिंदी साहित्येतिहास के कालविभाजन तथा नामकरण का परिचय देना।
3. आदिकालीन, भक्तिकालीन, रीतिकालीन प्रमुख साहित्यिक प्रवृत्तियों, रचनाकारों और रचनाओं से परिचित कराना।

बी. ए. तृतीय वर्ष कला (शैक्षिक वर्ष 2021–2022 से)

पंचम अयन **(Fifth Semester)**

पाठ्यचर्या : **Discipline Specific Elective 2 C (S4)** भाषाविज्ञान (सामान्य परिचय)

3 कर्मांक **(3 Credit) + 1***

उद्देश्य :

1. भाषाविज्ञान के स्वरूप का परिचय देना।
2. छात्रों को भाषाविज्ञान की व्याप्ति समझाना।
3. भाषाविज्ञान के अध्ययन की दिशाओं का परिचय देना।
4. भाषाविज्ञान के अनुप्रयोगात्मक पक्ष को समझाना।
5. साहित्य–अध्ययन में भाषाविज्ञान की उपयोगिता समझाना।

षष्ठ अयन **(Sixth Semester)**

पाठ्यचर्या : **Discipline Specific Elective 1 D (S3)** हिंदी साहित्य का इतिहास (आधुनिक काल सामान्य परिचय)

3 कर्मांक **(3 Credit) + 1***

उद्देश्य :

1. आधुनिक काल की पृष्ठभूमि से छात्रों अवगत कराना।
2. भारतेंदु युगीन, द्विवेदी युग के काव्य की विशेषताओं से छात्रों को अवगत कराना।
3. आधुनिक काल के रचनाकारों और रचनाओं से परिचित कराना।
4. हिंदी गद्य के उद्भव और विकास से छात्रों को अवगत कराना।

षष्ठ अयन **(Sixth Semester)**

पाठ्यचर्या : **Discipline Specific Elective 2 D (S4)** हिंदी भाषा और उसका विकास

3 कर्मांक **(3 Credit) + 1***

उद्देश्य :

1. भाषाविज्ञान के स्वरूप का परिचय देना।
2. छात्रों को भाषाविज्ञान की व्याप्ति समझाना।
3. भाषाविज्ञान के अध्ययन की दिशाओं का परिचय देना।
4. भाषाविज्ञान के अनुप्रयोगात्मक पक्ष को समझाना।
5. साहित्य–अध्ययन में भाषाविज्ञान की उपयोगिता समझाना।

बी. ए. तृतीय वर्ष कला (शैक्षिक वर्ष 2021–2022 से)

पंचम अयन **(Fitth Semester)**

पाठ्यचर्या : **Skill Enhancement Course 2 C** पाठ्यचर्या : पटकथा लेखन

2 कर्मांक **(2 Credit)**

उद्देश्य :

1. छात्रों को स्क्रिप्ट लेखन, अर्थ, परिभाषा से अवगत कराना।
2. छात्रों को कथा, पटकथा और संवाद से परिचित कराना।
3. छात्रों को ड्राफ्ट बनाने से परिचित कराना।

बी. ए. तृतीय वर्ष कला (शैक्षिक वर्ष 2021–2022 से)

षष्ठ अयन **(Sixth Semester)**

पाठ्यचर्या : **Skill Enhancement 2 D** पाठ्यचर्या : साहित्य और फिल्मांतरण

2 कर्मांक **(2 Credit)**

उद्देश्य :

1. छात्रों में सिनेमा का स्वरूप से परिचित कराना।
2. छात्रों को हिंदी साहित्य और सिनेमा के अन्तसंबंध से परिचित कराना।
3. छात्रों को हिंदी उपन्यासों पर आधारित फिल्मों से अवगत कराना।

3. ENGLISH

TITLE OF THE PAPER: ENHANCING EMPLOYABILITY SKILLS (CREDIT-3)

Prescribed Text- *Aspirations: English for Careers* (Board of Editors- Orient BlackSwan)

Course Outcomes:

After studying the paper successfully, the learners will be able:

1. To get the awareness of career opportunities available to them.
2. To identify the career opportunities suitable to them.
3. To understand the use of English in different careers.
4. To develop competence in using English for the career of their choice.
5. To enhance skills required for their placement.
6. To use English effectively in the career of their choice.
7. To exercise verbal as well as nonverbal communication effectively for their career.

DISCIPLINE SPECIFIC ELECTIVE (DSE-1C& DSE-1D) (OLD S-3)

Title of the Paper: Appreciating Novel (Credit-3+1=4)

Course Outcomes:

a) To introduce students to the basics of novel as a literary form

b) To expose students to the historical development and nature of novel

c) To make students aware of different types and aspects of novel

d) To develop literary sensibility and sense of cultural diversity in students

e) To expose students to some of the best examples of novel

DISCIPLINE SPECIFIC ELECTIVE (DSE-2C & DSE-2D) (OLD S-4)

Title of the Paper: Introduction to Literary Criticism (Credit-3+1=4)

Course Outcomes:

a) To introduce students to the basics of literary criticism

b) To make them aware of the nature and historical development of criticism

c) To make them familiar with the significant critical approaches and terms

d) To encourage students to interpret literary works in the light of the critical approaches

e) To develop aptitude for critical analysis

SKILL ENHANCEMENT COURSE (SEC 2-C & SEC 2-D)

Title of the Paper: ***Mastering Life Skills and Life Values***

Course Outcomes:

1. To equip the students with the social skills
2. To train the students interpersonal skills
3. To build self-confidence and communicate effectively
4. To Encourage the students to think critically
5. To learn stress management and positive thinking
6. To enhance leadership qualities
7. To aware the students about universal human values
8. To develop overall personality of the students

4. GEOGRAPHY

GEOGRAPHY OF DISASTER MANAGEMENT-I CC1E(NO. OF CREDITS: 03)

Objectives:

1) To introduce students the concept of disaster & its relation with Geography.

2) To acquaint the students with the utility & application of hazards in different areas & its management.

3) To make the students aware of the need of protection & disaster management

GEOGRAPHY OF TOURISM- I CC1E(NO. OF CREDITS: 03)

Objectives:

1) To understand the history of Tourism

2) To introduce the students to the basic concepts in Tourism Geography.

3) To understand the types of Tourism

4) To gain knowledge different aspects of Tourism Geography.

GEOGRAPHY OF INDIA -I DSE 1 C(NO. OF CREDITS: 03)

Objective:

1. To acquaint the students with geography of our Nation.

2. To make the student aware of the magnitude of problems and Prospects at National level.

3. To help the students to understand the inter relationship between the subject and the society.

4. To help the students to understand the recent trends in regional studied

GEOGRAPHY OF RURAL DEVELOPMENT -I DSE 1 C(NO. OF CREDITS: 03)

Objectives:

1. To understand the concept, nature and scope of rural development in India.

2. To overview various approaches to rural development.

3. To discuss some important issues related to rural development.

4. To study various schemes and policies for rural health in India.

PRACTICAL GEOGRAPHY- I

(Techniques of Spatial Analysis) DSE- 2 C

(No. of Credits: 04)

Objective:

1. To introduce the basic concepts and techniques of Geographical Analysis.

2. To introduce the students with SOI Toposheets and acquire the Knowledge of Toposheet interpretation.

3. To introduce the students with Weather Maps and acquire the Knowledge of its interpretation.

4. To introduce the students with Aerial Photographs and Satellite Images and acquire knowledge to interpret it .

5. To acquaint students with the spatial and structural characteristics of Practical Geography.

6. To explain the elementary and essential principles on field of practical work.

SEC 2 C VALUE/SKILL BASED COURSE RESEARCH METHODOLOGY – I CREDIT - 2

Objectives:

1. To develop the understanding of the basic concept of research
2. To develop the understanding of the basic framework of sampling and data collection
3. To develop the understanding of various sampling methods and techniques

GEOGRAPHY OF TOURISM- II CC1F(NO. OF CREDITS: 03)

Objectives:

1. To understand the history of Tourism
2. To introduce the students to the basic concepts in Tourism Geography.
3. To understand the types of Tourism
4. To gain knowledge different aspects of Tourism Geography.

Semester VI

GEOGRAPHY OF INDIA -II DSE1 D**(NO. OF CREDITS: 03)**

Objective:

1. To acquaint the students with geography of our Nation.
2. To make the student aware of the magnitude of problems and Prospects at National level.
3. To help the students to understand the inter relationship between the subject and the society.
4. To help the students to understand the recent trends in regional studied

GEOGRAPHY OF RURAL DEVELOPMENT II DSE 1 D (NO. OF CREDITS: 03)

Objectives-

1. To study the problems and policies related to education in rural areas.
2. To create awareness among the students about various area development programmes and Target Group Programmes implemented in India.
3. To create a positive approach for rural development among the students through the examples of successful case studies.

5. ECONOMICS

T.Y.B.A. Economics

GENERAL PAPER-III: INDIAN ECONOMIC DEVELOPMENT-I

Course Learning Outcomes

At the end of the course the learner will have ability -

- To relate and recognize the concept and indicators of Economic Development.
- To describe and analyze the concept and indicators of Human Development.
- To explain the characteristics of Developing and Developed Countries.
- To describe the constraints to the process of Economic Development.

GENERAL PAPER- III: INDIAN ECONOMIC DEVELOPMENT-II

Course Learning Outcomes

At the end of the course the learner will have ability-

- To describe and explain the process of Economic Planning.
- To describe and examine the changing structure of planning process in India.
- To describe and explain the relation between Economic Development and Environment.

SPECIAL PAPER - III: INTERNATIONAL ECONOMICS-I

Course Learning Outcomes

At the end of the course the learner will have Ability

- To relate and recall the concepts of International Economics and International Trade.
- To describe and apply the theories of international trade.
- To explain and comprehend the issues relating to Terms of trade and Balance of Payment.

SPECIAL PAPER - III: INTERNATIONAL ECONOMICS-II

Course Learning Outcomes:

At the end of the course, the learner will have-

- Ability to relate and explain the concept of Exchange Rate and Foreign Exchange Market.
- Ability to describe the trends in Growth, Composition and Direction of India's Foreign Trade.
- Ability to comprehend the issues relating to Foreign Capital and Regional and International Co-Operation.

SPECIAL PAPER – IV: PUBLIC FINANCE –I

Objectives:

1. To make students to analyze the role of Public Finance in Economic Development.

2. To know the sources of Revenue, Expenditure and Debt of Govt. of India.

3. To make students competent to become success in competitive examination.

Course Learning Outcomes

At the end of the course the learner will have ability-

- To relate and recognize the Nature and Scope of Public Finance.
- To describe and analyze the concept of Public Revenue and its components.
- To explain types of Public Expenditure and reasons for rising Public Expenditure.
- To explain the types of Public Debt and its effects.

SPECIAL PAPER – IV: PUBLIC FINANCE –II

Objectives:

1. To make students able to analyze Budget process of India.

2. To make the students aware about Role and working of Finance Commission.

3. To make students competent to become success in competitive examination.

Course Learning Outcomes

At the end of the course the learner will have ability

- To explain and assess the components and instruments of Fiscal Policy.
- To relate to the concepts of Budget and its components.
- To describe and analyze the concept of Deficit Financing and its effects.
- To describe and explain the Centre and State Financial Relationship.

SEC 3A: BUSINESS MANAGEMENT-I

Course Learning Outcomes:

At the end of the Course, the Learner will have the following skills:

- Management of Business.
- Business planning and decision making
- Leadership Skills- Ability to work in teams at the same time, ability to show leadership

Qualities

SEC-3A: BUSINESS MANAGEMENT-II (PROJECT REPORT)

Course Learning Outcomes:

At the end of the Course, the Learner will have the following skills:

- Analytical Skills – Ability to analyze data collected and interpret in the most logical manner
- Project Report Writing Skills- Ability to comprehend and illustrate/demonstrate findings
- Presentation Skills – PPT/Poster- Ability to illustrate findings in the most appealing manner
- Leadership Skills: Ability to show leadership skills with business ideas or work on business ventures as a practical example

6. HISTORY

SEMESTER V: COURSE TITLE: - INDIAN NATIONAL MOVEMENT (1885-1947)

Learning Objectives:

1. The course is designed to make the students aware about the making of Modern India and the struggle for independence.

2. To make the students aware of the multi-dimensionality of Modern India.

3. To highlight the ideas, institutions, forces and movements that contributed to be shaping of Indian Modernity.

4.To acquaint the students with various interpretative perspectives.

Learning Outcomes:

1. It will enable students to develop an overall understanding of Modern India.

2. It will increase the spirit of healthy Nationalism, Democratic Values and Secularism among the Students.

3. Students will understand various aspects of the Indian Independence Movement and the creation of Modern India.

SEMESTER V COURSE TITLE: - WORLD CIVILIZATION AND HERITAGE (PART I)

Course Objectives:

1.To Introduce students to the various concept and theories of World Civilization.

2.To study the types of Stone Culture and its various aspects.

3.To acquaint the students with rise and growth of Ancient Civilization in West Asia.

4.To understand about Ancient Civilization of China and its various parts.

5.To enable the students to understand the Ancient Indian Civilization and its town planning, socio-economic, religious life as well as Vedic Civilization.

Course Outcomes:

1. Students will be aquanaut with the knowledge of how the Human Civilization process was start.

2. The History of World Civilization course will be developing the curiosity in students the rise and growth of Ancient Civilization in world.

3. This curriculum develops the attitude of contemporary students towards the World Civilization.

SEMESTER –V COURSE TITLE: INTRODUCTION TO HISTORIOGRAPHY

Objectives:

1. To orient students about how History is studied, written and understood.

2. To explain methods and tools of data Collection

3. To study the types of Indian Historiography.

4. To describe importance of Inter-Disciplinary Research.

5. To introduce Students to the basics of Research.

Course Outcomes:

1. Students will be introduced to the information and importance of Historiography.

2. Students will be introduced to the different Methods and Tools of data collection.

3. Students can study the interdisciplinary approach of History.

4. Students will learn about the usefulness of History in the 21st century, its changing perspectives, the new ideas that have been invented, and the importance of History in a competitive World.

SEMESTER –V COURSE TITLE: MAHARASHTRA IN THE 19TH CENTURY

Course Objectives:

1. To Introduce the students to the history of 19th century in Maharashtra

2. To study Political, Social, Economic and conceptual History of the 19th Century Maharashtra in an analytical way with the help of primary sources.

3. To evaluate contribution of 19th century in Maharashtra to the establishment of Maharashtra state contribution of successors and later development of the 19th century Maharashtra

4. To study Socio-religious System of the 19th Century in Maharashtra.

Course Outcomes:

1. Student will develop the ability to analyse sources for 19th century Maharashtra History.
2. Student will learn significance of Regional History and Socio- religious reformism foundation of the region.
3. It will enhance their perception of 19th Century Maharashtra.
4. Appreciate the skills of leadership and the Socio-religious System of the Maharashtra.

SEMESTER -V COURSE TITLE- CONSTITUTIONAL DEVELOPMENT IN INDIA (1773-1853)

Course Objectives:

1. To Introduce the students to evolution of Constitution of India.
2. To study Factors and Situations that shaped the Constitutions.

Course Outcomes:

1. Students will understand evolution of Constitution of India.
2. Student will learn factors and conditions that contributed to constitution of India
3. Students will understand the Democratic Processes and thereby strengthen Democracy.

SEMESTER V: -SEC: 9 COURSE TITLE: SOUTH INDIAN ART AND ARCHITECTURE

(From 4th Century A.D. to 12th Century A.D.)

Objectives:

1. To acquaint the students, the Arts and Architecture of South India.
2. To acquaint the students, the and development of the Arts and Architecture of South India.
3. To enable the students to understand the Process of development of the Arts and Architecture of South India.
4. To create an interest among the students for the study of Arts and Architecture of South India.

Course Outcomes:

1.Students will get an overall understanding of the development of the Art and Architecture in South India.

2. They will understand the changing patterns of the Art and Architecture in South India.

3. They will understand the impact of Persian Art on Islamic Art and Architecture in South India

SKILL ENHANCEMENT COURSES (SEC 2 C) – (2 CREDITS)

Semester V -SEC -:10 Research Paper Writing

Objectives

1. To describe importance of Inter-Disciplinary Research.

2. To introduce students to the Basics of Research.

3. To Describe the Research Outline

Course Outcomes:

1. Students will be introduced to the information and importance of Historiography.

2. Students can study the interdisciplinary approach History.

SKILL ENHANCEMENT COURSES (SEC 2 C) – (2 CREDITS)

Semester V -SEC: 11 Course Title: - Museology

Objectives:

1. To acquaint the students with the rise and development of Museum.

2. To impart to the students an understanding of the importance of material history through Museum.

3. To encourage the students to collect the material or sources of History for local, regional and National History through Museum.

4. To enable the students to collect Various Articles as a tool of History.

Course Outcomes:

1.The Students will understand the Concepts of Museum ad learn the basic Principles of Museology

2 The Students will gain Comprehensive Knowledge of the Process of Cringe and Conserving Museum of objects

Core Course 4 (3 Credit)

SEMESTER VI: COURSE TITLE: - INDIA AFTER INDEPENDENCE- (1947-1991)

Objectives:

1. To make the students aware about the making of Contemporary India and events that panned out in the Post-Independence Era.
2.To make the students aware of the Multi-Dimensionality of Modern India.
3.To highlight the ideas, institutions, forces and movements that contributed to the shaping of Indian Modernity.
4.To acquaint the students with various Interpretative and Analytical perspectives.

Course Outcomes:

1. It will enable students to develop an overall understanding of the Contemporary India.
2. To increase the spirit of healthy Nationalism, Democratic Values and Secularism among the students.
3. Students will understand various aspects of India's domestic and foreign policies that shaped Post-Independence India.

Core Course 4 History of Civilization (3 Credit)

SEMESTER VI COURSE TITLE: -WORLD CIVILIZATION AND HERITAGE (PART II)

Course Objectives:

1. To Orient students about Western Classical Civilization of Greece and Roman.
2. To introduce students to the Arab Civilization and its various aspects.
3. To study various Concept and theory's in Medieval Europe.
4. To understand the Renaissance- Reformation Movement and impact of various Past Civilizations.
5. To create motivation and curiosity among the students through the age of discoveries in Ancient and Medieval times.

Course Outcomes:

1. Students will be oriented about Western Classical Civilization of Greece and Rome.

2. Students will be introduced to Arab Civilization and its impact on world Civilization.

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE-3C) -(3 CREDIT)

Semester –VI, Course Title: Applied History

Course objectives:

1) To Introduce students to information and importance of Applied History.

2) To help students understand the usefulness of history in the 21st century, its changing perspectives, the new ideas that have been invented, and the importance of History in a Competitive World.

3) To inform the students about the historical significance of Archaeology and Archives and the opportunities in the field of Archaeology and Archives through this course.

4) To inform the students about the opportunities in the field of Media, Museums through this Course.

Course Outcomes:

1. Students will be introduced to the information and importance of applied history.

2. Student will learn about the Historical significance of Archaeology and Archives and opportunities in the field of Archaeology and Archives.

3. Through this course, students will be informed about the opportunities in the field of Media, Museums.

4. the about learn will Students usefulness of history in the 21st Century, its changing Perspectives, the new ideas that have been invented, and the importance of History in a Competitive World.

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE-4D)- (3) CREDIT

Semester -VI, Course Title: History of Maharashtra in the 20thCentury

Course Objectives:

1. To Introduce the students to the history of 20th Century in Maharashtra

2. To study Political, Social, Economic and Conceptual History of the 20th Century Maharashtra in an Analytical way with the help of Primary Sources.

3. To evaluate contribution of 20th Century in Maharashtra to the establishment of Maharashtra state contribution of successors and later development of the 19th century Maharashtra

4. To study Socio-Religious System of the 20th Century in Maharashtra.

Course Outcomes:

1. Student will develop the ability to analyses sources for 20th Century Maharashtra History.

2. Student will learn significance of regional history and Socio- Religious Reformism foundation of the region.

3. It will enhance their Perception of 20th Century Maharashtra.

4. Appreciate the skills of leadership and the Socio-Religious System of the Maharashtra.

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE-4D)- (3) CREDIT

Semester -VI, Course Title- Constitutional Development in India (1858-1950)

Course Objectives:

1. To Introduce the Students to evolution of Constitution of India.
2. To Study factors and Situations that shaped the Constitutions.

Course Outcomes:

1. Student will understand evolution of Constitution of India.
2. Student will learn factors and conditions that contributed to Constitution of India
3. Students will understand democratic processes and thereby strengthen Democracy.

SKILL ENHANCEMENT COURSES (SEC 2 D) – (2 CREDITS

Semester VI SEC: 12 Course Title: -Heritage Management

Course Objectives:

1. To understand the introduction of Heritage Management to the Students
2. To get an Opportunity to seek self-employment to the students

Course Outcomes:

1. Student will understand over all process of Heritage Management
2. Student will get the knowledge about scope and the fact of Heritage Management.
3. The students will enable to understand about legal and commercial framework of Heritage

SKILL ENHANCEMENT COURSES (SEC 2 D) – (2 CREDITS)

Semester VI: 13 Course Title: - Archaeology

Course Objectives:

1. This paper is designed to introduce the students to the Key Concepts and practical approaches in Archaeology, highlighting their applications in interpreting the Human past.

2. It will enable students to understand the definition, aims and scope of Archaeology and its development as a discipline will be introduced to the Students.

3. The nature of the Archaeological record and the unique role of science in Archaeology is explained to the students.

4. Legislation related to Archaeology and the role of Archaeology in Heritage Management is also discussed in this course.

Course Outcomes:

1. Students will learn to understand the definition, aims and scope of Archaeology so as to understand its applications in interpreting the human past.

2. They will be able to understand the nature of the archaeological record and the unique role of science in archaeology.

3. They will have an overall understanding of the Archaeology.

SKILL ENHANCEMENT COURSES (SEC 2 D) – (2 CREDITS

Semester VI -SEC:14 Course Title: Numismatics

Course Objectives:

1. This paper is designed to introduce the students to the Currency system of Ancient India.
2. It aims at acquainting the students about the development in the Coinage System.

Course Outcomes:

1. Students will be able to identify and decipher the Coins.

2. They will also be able to understand the Socio-Political background that accurse through the coinage of that time; thus getting holistic picture of that economic system prevalent in Ancient India.

7. POLITICAL SCIENCE

LOCAL SELF GOVERNMENT IN MAHARASHTRA

Objectives:

1. To introduce the evolution of Local Self Government in Maharashtra
2. To make students aware about 73rd and 74th Constitutional Amendments
3. To introduce the students the structure of Local Self Government
4. To make students aware about composition, power and functions of local bodies

DISCIPLINE SPECIFIC ELECTIVE COURSE

PUBLIC ADMINISTRATION

Objectives:

This paper is an introductory course in Public Administration. The essence of Public Administration lies in its effectiveness in translating the governing philosophy into programmes, policies and activities and making it a part of community living. The paper covers personnel public administration in its historical context thereby proceeding to highlight several of its categories, which have developed administrative salience and capabilities to deal with the process of change. The recent developments and particularly the emergence of New Public Administrations are incorporated within the larger paradigm of democratic legitimacy. The importance of legislative and judicial control over administration is also highlighted

INTERNATIONAL RELATIONS

Objectives:

This paper deals with concepts and dimensions of International Relations and makes an analysis of different theories highlighting the major debates and differences within the different theoretical paradigms. The dominant theories of power and the question of equity and justice, the different aspects of balance of power leading to the present situation of a unipolar world are included. It's highlights various aspects of conflict and conflicts resolution, collective security and in the specificity of the long period of the post second world war phase of the cold war, of Detent and Deterrence leading to theories of rough parity in armaments.

SAMYUKTA MAHARASHTRA MOVEMENT

Objectives:

1. This Course is an introduction to the political process in Maharashtra with special reference to regionalism sub-regionalism and Samyukta Maharashtra Movement.
2. The aim of the course is that students are expected to understand both the historical evolution of Maharashtra's politics and different analyses of politics of the state.
3. It tries to acquiant students with the main issues and concerns in the public life of a regional society as it shaped in the concept of colonialism, nationalism and modernity.

PUBLIC ADMINISTRATION

Objectives:

This paper is an introductory course in Public Administration. The essence of Public Administration lies in its effectiveness in translating the governing philosophy into programmes, policies and activities and making it a part of community living. The paper covers personnel public administration in its historical context thereby proceeding to highlight several of its categories, which have developed administrative salience and capabilities to deal with the process of change. The recent developments and particularly the emergence of New Public Administrations are incorporated within the larger paradigm of democratic legitimacy. The importance of legislative and judicial control over administration is also highlighted

LOCAL SELF GOVERNMENT IN INDIA

Objectives:

1. To acquaint the students with the Objectives, Structure and Functions of Local Government.
2. To acquaint the students with the working of the urban and rural system of Local Government.
3. To identify the role of Local Government in development.

FINANCIAL ADMINISTRATION

Objectives:

1. To acquaint the students with the Objectives, Structure and Functions of Financial Administration
2. To acquaint the students with the working of the system of Financial Administration.
3. To identify the role of Financial Administration in Development.

ADMINISTRATIVE THINKERS

Objectives:

1. To acquaint the students with the main administrative ideas of major administrative thinkers;
2. To make the students aware of the contributions made by these thinkers to the administrative thinking.

COMMERCE FACULTY

COMMERCE

Subject Name: BUSINESS REGULATORY FRAMEWORK

Objectives of the Program

1. To provide conceptual knowledge about the framework of business Law in India.
2. To orient the students about the legal aspect of business.
3. To create awareness among the students about legal environment relating to the Contract Law, Partnership Act, Sale of Goods Act in India.
4. To understand the emerging issues relating to e-commerce, e-transaction issues and E Contracts
5. To seek the career opportunity in corporate sector relating to business law in India.
6. To acquaint students with the basic concepts, terms & provisions of Mercantile and Business Laws.

Paper: ADVANCED ACCOUNTING – I

Objectives of the course

1. To acquaint the student with knowledge about various concepts, objectives, and applicability of some important accounting standards.
2. To develop the knowledge among the students about reorganization of business regarding restructuring the capital.
3. To update the students with knowledge for preparation of final accounts of a Banking Companies with the provisions of Banking Regulation Act
1949.
4. To empower to students with skills to prepare the investment account in simple and summarized manner.

Objectives of the Program

1. To instill the knowledge about accounting procedures, methods and techniques.
2. To impart students' knowledge of various Advanced Accounting Concepts.

Subject: **INDIAN & GLOBAL ECONOMIC DEVELOPMENT**

1.To develop ability to analyze economic development process of India.

2. To impart knowledge about the relevance of economic practices in modern competitive world.

3. To help the students develop a sound theoretical foundation for their future academic ventures.

Course Outcomes:-

1.Students will be able to understand present Economic Scenario of Indian Economy as well as World Economy.

2.Students will be able to understand the various aspects of development in Agricultural, Industrial and service sector in India.

3.Student will be able to critically evaluate the role of India in international economy.

4. Students will be able to evaluate the working of international financial organization and institutions.

Subject**: INTERNATIONAL ECONOMICS-I**

Objectives:

1. To acquaint the students with the basic theories of international trade and international economics.

2. To help the students evaluate the working and functions of international organizations and institutions.

3. To develop a foundation in the subject that will help the students in their future academic and professional ventures.

Course Outcomes:-

1.Students will be able to understand present Economic Scenario of Indian Economy as well as World Economy.

2.Students will understand the working of foreign trade market and foreign exchange market.

3. Students will be able to comprehend trade policies and concepts related to trade policies.

Subject: **AUDITING**

Objectives of the Course:

1. To acquaint themselves about the Definition, Nature,Objectives and Advantages of Auditing, Types of Audit, Errors and Fraud, Audit Program,
Notebook, Working Paper, Internal Control, Check.
2. To get knowledge about concept of Checking, Vouching, Verification and Valuation, Types of Audit Report and Auditing Assurance Standard.
3. To understand theprovision related Qualification, Disqualification, Appointment, Removal, Rights ,Duties and Liability of Company Auditor and
Provisions regarding Tax Audit as per Income Tax Act 1961 (Section 44 AA to 44AE).
4. To know the various new concepts in computerized system and Forensic Audit.

Subject : - **BUSINESS ADMINISTRATION – II (HUMAN RESOURCE MANAGEMENT)**

1. To acquaint the student with knowledge about various Concepts , Objectives of the Human Resource Function , to identify the difference
between Human Resource Management and Human Resource Development
2. To update the students on the emerging trends in the area of Human Resource Management
3. To develop understanding among the students the process of Recruitment and Selection, understanding the various means and methods
associated with the Recruitment and Selection function
4. To educate the students on the importance of Training and Development and its impact on Career Planning and Development.
5. To acquaint the students on the concept of Performance Appraisal ,d the process for effective Performance appraisal and imbibe the values of
Ethical Performance appraisal among the students.

SPECIAL ELECTIVE COURSE (Special Course – II)

Banking and Finance-Special Paper II (Semester-V)
(Financial Markets and Institutions in India – I Course code: 355-B

· **Objectives:**

· 1. To acquaint the students with Indian Financial System and its various segments.

· 2. To make the students aware about Indian Money Market.

· 3. To analyse and understand the functions of Indian Capital Market.

· 4. To enable the students the functioning of Foreign Exchange Market.

SUBJECT NAME: - **BUSINESS LAWS AND PRACTICE PAPER II (BLP-II)**

Objectives of the course:

To develop an understanding of the significant provision of selective Business & labour Laws.

To acquaint the students to address a basic business legal application-oriented issues.

Objectives of the Subject:

· To impart the students with the fundamental understanding of important business laws.

· To study & acquaint students an application based knowledge of various Business & Labour Laws.

· To familiar the students with legal Business Environment of India.

· To develop & strengthen students through the legal practical knowledge and their importance to the Indian Business organizations.

Subject: --: **CO-OPERATION & RURAL DEVELOPMENT ((SPECIAL PAPER-II)**

Objectives of the Course:

1)To create awareness among students about co-operative marketing

2)To develop the capability of students for knowing different types Marketing.

3)To create awareness about the role of National Agricultural Co-operative Marketing Federation (NAFED)

Subject Name -: COST AND WORKS ACCOUNTING. SPECIAL PAPER II

Subject Title -:Overhead and Accounting for Overheads

Objectivs:

1. To provide knowledge about the concepts and principles of overheads.
2. To Introduce the cost accounting standards and the cost accounting standard board.
3. To understand the stages involved in the accounting of overheads.
4. To build an ability towards strategic overhead accounting under Activity Based Costing

Subject Name: - **BUSINESS STATISTICS II**

Objective of the Course

1. To understand and Master the concepts of Probability.
2. To understand the concepts of discrete probability distributions.
3. To make students to understand the art of applying statistical techniques to solve some real life problems.
4. To gain knowledge of Statistical Computations.

Subject -: **BUSINESS ENTREPRENEURSHIP (SPECIAL PAPER II)**

Objectives:

1) To Develop understanding of MSME and its formation
2) To Develop Knowledge and understanding in creating and managing new venture.
3) To Equip students with necessary tools and techniques to set up their own business venture
4) To help students to bring out their own business plan.
5) To make students aware about business crises and sickness.

MARKETING MANAGEMENT-II

Objectives:

● The objective of this course is to facilitate understanding of the conceptual framework of marketing and its applications in decision making under various
environmental constraints.

● The course will make learners understand how to make effective marketing decisions, including assessing marketing opportunities and developing marketing

strategies and implementation plans.

Subject: **AGRICULTURAL AND INDUSTRIAL ECONOMICS II**

Objectives:

1. To understand the concept of Agricultural Marketing and related Issues.
2. To impart adequate knowledge role of Agricultural Processing in India.
3. To understand the Role, Importance and Growth of Major Industries in India.
4.To get acquainted with the role and problems of Public sector Enterprises in India.

Subject: **DEFENCE BUDGETING FINANCE AND MANAGEMENT SPECIAL PAPER – II**

Objectives:

1. Understanding the importance of Defence Budget
2. To know the latest development of Indian Defence Industry.
3. To know the concept financial management regarding defence.
4. Understanding Defence Expenditure.

Subject- **INSURANCE, TRANSPORT & TOURISM-I**

Objectives:

· To acquaint the students with basic insurance terminology.
· To aware about risk management and develop proper understanding in insurance.
· To study the various pricing elements and its importance.
· To review the various legislations and its application to insurance business in India

Subject- **COMPUTER NETWORKING AND E-COMMERCE-I.**

Course Objectives:

1. To know about computer network.
2. To understand different topologies used in networking
3. To learn different types of network.

4. To understanding the use of connecting device used in network.

Subject : - **BUSINESS ADMINISTRATION – III (FINANCE)**

Objectives of the course

1. To acquaint the student with knowledge about Corporate Finance and the structure if the Indian Financial Market
2. To develop the Financial Planning Skills among the Students by introducing them to the process of efficient Financial Planning
3. To educate the students on the importance of Capitalisation and the importance to maintaining an optimum capital structure
4. To create awareness among the students in the various sources of Finance available for raising corporate capital

SPECIAL ELECTIVE COURSE (Special Course – III)

Banking and Finance-Special Paper III (Sem.V)

(Banking Law and Practices in India – I Course code: 356-B

Objectives:

1. To familiarize the Banking Laws and Practice in correlation to the Banking System in India.
2. To understand the legal aspects of Banking transactions and its implication as a Banker and as a customer.
3. To familiarize the students with the Banking Laws and Practices in India.
4. To make students capable of understanding and applying the legal and practical aspects of banking to help them technically sound in

banking parlance.

SUBJECT NAME: - **BUSINESS LAWS AND PRACTICE PAPER II (BLP-II)**

Objectives of the Subject:

· To impart the students with the fundamental understanding of rules & regulations under various business laws.

· To study & acquaint students an application & overview based knowledge of Laws.

· To make the students aware about legal Business Environment of India.

Subject: --: **CO-OPERATION & RURAL DEVELOPMENT ((SPECIAL PAPER-III)**

Objectives of the Course:

1) To acquaint students with the Co-operative Management.

2) To study the Co-operative Organization and Management

Cost and Works Accounting Special Paper III

Name -: **TECHNIQUES OF COST ACCOUNTING**

Objectives:

1. To prepare learners to understand the basic techniques in Cost Accounting

2. To understand the learner, application of Cost Accounting techniques in cost control and decision making.

3. To enable the learners to prepare various types of Budgets.

4. To learn the basic concept of Uniform Costing and Inter-firm comparison

5. To enhance the knowledge of students about MIS and Supply Chain Management.

BUSINESS STATISTICS – III

Objective of the Course

1. To understand and Master the concepts of Game Theory.

2. To understand and Master the concepts of Statistical Decision Theory.

3. To understand and Master the concepts of Replacement and Sequencing Problems

4. To understand and Master the concepts of Statistical Quality Control.

Subject : - **BUSINESS ENTREPRENEURSHIP (SPECIAL PAPER-III**)

Objectives of the course:

1) To acquaint students with knowledge and skills required for organizing and carrying out entrepreneurial activities.

2) To develop the ability of analyzing and understanding business situations.

3) To study the interdependent, fast-changing and diverse world of entrepreneurship and innovation.

4) To familiarize students with various concepts and processes involved in entrepreneurship and business formation and development.

5) To provide students with the knowledge, skills and motivation to encourage entrepreneurial approach in a variety of settings.

6) To study the application of group dynamics to counseling, personal growth and other psychologically-oriented groups.

SPECIAL ELECTIVE COURSE (SPECIAL COURSE PAPER – III)

Marketing Management _Course Code: 356(H)

Objectives of the Course:

1. To introduce the concept of advertising and advertising media.
2. To provide the students the knowledge about appeals and approaches in advertisement.
3. To acquaint the students to the economic ,social and regulatory aspects of advertising.
4. To make the student understand the role of Brand Management in marketing.
5. To enable the students to apply this knowledge in preciseby enhancing their skills in the field of advertising.

Subject: **AGRICULTURAL AND INDUSTRIAL ECONOMICS II**

Objectives:

1. To understand the concept of Agricultural Marketing and related Issues.
2. To impart adequate knowledge role of Agricultural Processing in India.
3. To understand the Role, Importance and Growth of Major Industries in India.
4.To get acquainted with the role and problems of Public sector Enterprises in India.

Subject**: DEFENCE BUDGETING FINANCE AND MANAGEMENT SPECIAL PAPER – III**

Objectives:

1. To understand the impacts of war & how the economic structure affects
2. To know the elements of war ability
3. To understand the challenges in 21st century against Defence.
4. To Understand the system of financial management in Defence

Subject: **INSURANCE, TRANSPORT & TOURISM-I**

Objectives:

· To know the insurance customer and their behaviors.

· To understand the principles of underwriting and its process.

· To study the insurance market and its regulators.

· To review the insurance business, challenges and its prospects.