

Rajgad Dnyanpeeth's

Anantrao Thopte College , Bohr Dist. Pune

**DEPARTMENT OF BACHELOR OF BUSINESS
ADMINISTRATION IN COMPUTER APPLICATION
B.B.A. (C.A)**

Programme: B.B.A(CA)

Programme Outcomes	
PO No.	Upon completion of the B.B.A(CA)Degree Programme the graduate will be able to
PO-1	To provide sound academic base from which an advanced career in Computer Application can be developed. Conceptual grounding in computer usage as well as its practical business application will be provided.
PO-2	To produce skill oriented human resource.
PO-3	To impart practical skills among students.
PO-4	To make industry ready resource.
PO-5	To bring the spirit of entrepreneurship.

Programme Specific Outcomes	
PSO No.	Upon completion of these courses the student would
PSO-1	Students should be able to apply modern practices and strategies in software project development using open-ended programming environments to deliver quality product for business success in context with societal needs.
PSO-2	An ability to gain knowledge on design and control strategy; techniques to secure information and adapt to the fast-changing world of information technology needs.
PSO-3	Design and develop Web and Mobile based computer applications
PSO-4	An ability to use and develop cloud software, administrative features, infrastructure services and architectural patterns; ethical hacking and forensic security technologies.

Course Title	Business Communication
CODE	CA - 101
CO No.	Course Outcomes
CO-1	To understand what is the role of communication in personal and business world
CO-2	To understand system and communication and their utility
CO-3	To develop proficiency in how to write business letters and other communications
CO-4	Apply the managerial functions in different business setup
CO-5	Implement decisions to ensure organizational effectiveness

Course Title	Principles of Management
CODE	CA - 102
CO No.	Course Outcomes
CO-1	Interpret and design the different forms of organization
CO-2	Demonstrate social responsibility and ethical issues involved in business situations and organizations
CO-3	Integrate management principles in real time situations
CO-4	Apply the managerial functions in different business setup
CO-5	Implement decisions to ensure organizational effectiveness

Course Title	C Programming
CODE	CA - 103
CO No.	Course Outcomes
CO-1	To understand the concept of Procedural Programming
CO-2	To acquire basic programming skills using C Programming Language
CO-3	Students will Improve logical thinking through practical knowledge of C Programming

CO-4	By learning the basic programming constructs they can easily switch over to any other language in future.
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Course Title	Database Management System
CODE	CA - 104
CO No.	Course Outcomes
CO-1	To understand role and importance File Structures and Organization
CO-2	To develop skills related with Database basic Concepts.
CO-3	To Develop right understanding of various Data models
CO-4	To Understand the Programming in SQL and Implementation
CO-5	To Learn about Relational Database Designing.

Course Title	Statistics
CODE	CA - 105
CO No.	Course Outcomes
CO-1	To understand role and importance of statistics in various business situations
CO-2	To develop skills related with basic statistical technique
CO-3	Develop right understanding regarding regression, correlation and data interpretation

Course Title	Computer Laboratory Based on 103 &104
CODE	CA - 106
CO No.	Course Outcomes
CO-1	To assess the knowledge of student in C and DBMS
CO-2	To acquire knowledge on writing computer programs using C Language
CO-3	To create and manage Database using SQL

Course Title	Principles of programming and algorithm
CODE	CA - 107

CO No.	Course Outcomes
CO-1	To develop analytical /logical thinking and problem solving capabilities
CO-2	To know the fundamentals of programming and designing.
CO-3	To learn the algorithm analysis and notations
CO-4	To understand the concept, problem and algorithm.

Course Title	Organization Behavior & Human Resource Management
CODE	CA - 201
CO No.	Course Outcomes
CO-1	To understand basic concept of HRM & OB
CO-2	To know the major trends in HRM & OB
CO-3	To make aware students about traditional & modern methods of procurement & development in organization
CO-4	To make aware students about on the job & Off the Job Training methods

Course Title	Financial Accounting
CODE	CA - 202
CO No.	Course Outcomes
CO-1	To develop right understanding regarding role and importance of monetary and financial transactions in business
CO-2	To cultivate right approach towards classifications of different transactions and their implications
CO-3	To develop proficiency preparation of basic financial as to how to write basis accounting statement - Trading and P&L

Course Title	Business Mathematics
CODE	CA - 203
CO No.	Course Outcomes
CO-1	To understand role and importance of Mathematics in various business situations and while developing softwares.
CO-2	To develop skills related with basic mathematical technique

Course Title	Relational database management System.
CODE	CA - 204
CO No.	Course Outcomes
CO-1	Enables students to understand relational database concepts.
CO-2	Enables students to understand transaction management concepts in database system..
CO-3	Enables student to write PL/SQL programs that use: procedure, function, package, cursor and trigger.
CO-4	To Understand SQL/PLSQL the programming language of oracle
CO-5	Get Fundamental Knowledge of subject in Brief along with Software.

Course Title	Web Technology HTML-JS-CSS
CODE	CA - 205
CO No.	Course Outcomes
CO-1	To know & understand concepts of internet programming.
CO-2	To understand how to develop web based applications using JavaScript

Course Title	Computer Laboratory Based on 204 & 205
CODE	CA - 206
CO No.	Course Outcomes
CO-1	To assess the knowledge of student in RDBMS and WebTechnology
CO-2	To acquire knowledge on writing computer programs usingconcept of Web Technology
CO-3	To create and manage Database using concept of RDBMS

Course Title	Add On (Advance C)
CODE	CA - 207
CO No.	Course Outcomes
CO-1	To study advanced concepts of programming using the ‘C’Language.
CO-2	To understand code organization with complex data types andstructures.
CO-3	To work with files.

Course Title	Digital Marketing
CODE	CA-301
CO No.	Course Outcomes
CO-1	The aim of this syllabus is to give knowledge about using digitalmarketing in and as business.
CO-2	To make SWOT analysis, SEO optimization and use of variousdigital marketing tools.
CO-3	To understand Case study and Exercise on various terms
CO-4	To understand Digital marketing for business purpose

Course Title	Data Structure
CODE	CA-302
CO No.	Course Outcomes
CO-1	To understand the concept of ADT's
CO-2	To learn linear data structures – lists, stacks, and queues
CO-3	To understand sorting, searching and hashing algorithms
CO-4	To apply Tree and Graph structures

Course Title	Software Engineering
CODE	CA-303
CO No.	Course Outcomes
CO-1	To understand system concepts.
CO-2	To understand Software Engineering concepts.

CO-3	To understand the applications of Software Engineering concepts and Design in Software development
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Course Title	Angular - JS
CODE	CA-304
CO No.	Course Outcomes
CO-1	By the end of this course, the students should be able to Understand Client Side MVC and SPA
CO-2	Explore AngularJS Component
CO-3	Develop an AngularJS Single Page Application
CO-4	Create and bind controllers with Javascript
CO-5	Apply filter in AngularJS application

Course Title	Big Data
CODE	CA-305
CO No.	Course Outcomes
CO-1	To enable learners to develop expert knowledge and analytical skills in current and developing areas of analysis statistics, and machine learning
CO-2	To enable the learner to identify, develop and apply detailed analytical, creative, problem-solving skills.
CO-3	Provide the learner with a comprehensive platform for career development, innovation and further study.

Course Title	Basic Course in Environmental Awareness
CODE	CA-307
CO No.	Course Outcomes
CO-1	Provide an opportunity to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment
CO-2	To develop conscious towards a cleaner and better managed environment

Course Title	Computer Laboratory Based on 302 , 304 and 305
CODE	CA-306
CO No.	Course Outcomes
CO-1	To assess the knowledge of student in Data Structure, AngularJS and R programming
CO-2	To acquire knowledge on writing computer programs using concept of Data Structure, Angular JS and R programming
CO-3	To create and manage Applications using Data Structure, Angular JS and R programming

Course Title	Networking
CODE	CA-401
CO No.	Course Outcomes
CO-1	To gain knowledge about Computer Networks concepts.
CO-2	To know about working of networking models, addresses,transmission medias and connectivity devices.
CO-3	To acquire information about network security and cryptography.

Course Title	Object Oriented Concepts Through CPP
CODE	CA-402
CO No.	Course Outcomes
CO-1	Acquire an understanding of basic object-oriented concepts andthe issues involved in effective class design.
CO-2	Enable students to write programs using C++ features like operator overloading, constructor and destructor, inheritance,polymorphism and exception handling.

Course Title	Operating System
CODE	CA-403
CO No.	Course Outcomes
CO-1	To know the services provided by Operating System
CO-2	To know the scheduling concept
CO-3	To understand design issues related to memory management andvarious related algorithms.
CO-4	To understand design issues related to File management andvarious related algorithms

Course Title	Advance PHP
CODE	CA-405
CO No.	Course Outcomes
CO-1	To know & understand concepts of internet programming.
CO-2	Understand how server-side programming works on the web.
CO-3	Understanding How to use PHP Framework (Joomla / Druple)

Course Title	Computer Laboratory Based on 402 and 404
CODE	CA-406
CO No.	Course Outcomes
CO-1	To assess the knowledge of student in CPP and Adv. PHP
CO-2	To acquire knowledge on writing computer programs using concept of CPP and Adv. PHP
CO-3	To create and manage Applications using CPP and Adv. PHP

Course Title	Cyber Security
CODE	CA-501
CO No.	Course Outcomes
CO-1	To understand the fundamentals of cyber security.
CO-2	To understand various categories of Cybercrime, Cyber-attacks on mobile, tools and techniques used in Cybercrime and case studies.
CO-3	To have an overview of the Cyber laws and concepts of Cyber forensics.

Course Title	Object Oriented Software Engineering
CODE	CA-502
CO No.	Course Outcomes
CO-1	To understand the fundamentals of object modeling
CO-2	To understand and differentiate Unified Process from other approaches.
CO-3	To design with static UML diagrams.
CO-4	To design with the UML dynamic and implementation diagrams.
CO-5	To improve the software design with design patterns.
CO-6	To test the software against its requirements specification.

Course Title	Core Java
CODE	CA-503
CO No.	Course Outcomes
CO-1	To introduce the object-oriented programming concepts.
CO-2	To understand object-oriented programming concepts, and apply them in solving problems.
CO-3	To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
CO-4	To introduce the implementation of packages and interfaces
CO-5	To introduce the concepts of exception handling and multithreading.
CO-6	To introduce the design of Graphical User Interface using applets and swing controls.

Course Title	Python
CODE	CA-504
CO No.	Course Outcomes
CO-1	Define and demonstrate the use of built-in data structures “lists” and “dictionary”.
CO-2	Design and implement a program to solve a real world problem.
CO-3	Design and implement GUI application and how to handle exceptions and files.

Course Title	Project
CODE	CA-505
CO No.	Course Outcomes
CO-1	Students can express their ideas clearly and effectively, both verbally and in written form.
CO-2	Students can work as a team to achieve common goals.
CO-3	Students are able to make links across different areas of knowledge and to generate, develop and evaluate ideas and information related to the project.
CO-4	Students are able to learn on their own, reflect on their learning and improve upon it.

Course Title	Computer Laboratory Based on 502 and 503
CODE	506
CO No.	Course Outcomes
CO-1	To assess the knowledge of student in Java Programming, Python
CO-2	To acquire knowledge on writing computer programs using concept of Java Programming, Python
CO-3	To create and manage Applications using Java Programming, Python

Course Title	Ad-on Internet of Things (IoT)
CODE	CA-507
CO No.	Course Outcomes
CO-1	To understand Technical aspects of Internet of things.
CO-2	To describe smart objects and IoT Architecture.
CO-3	To study and compare different Application protocols of IoT.
CO-4	To understand IoT platform using Arduino Uno.

Course Title	Recent Trends in IT
CODE	CA-601
CO No.	Course Outcomes
CO-1	To discuss the basic concepts AI.
CO-2	To apply basic, intermediate and advanced techniques to minethe data.
CO-3	To provide an overview of the concept of Spark programming.

Course Title	Software Testing
CODE	CA-602
CO No.	Course Outcomes
CO-1	Students will be introduced to testing tools.
CO-2	Students will acquire Knowledge of Basic SQA.
CO-3	Students will be able to design basic Test Cases.

Course Title	Advanced Java
CODE	CA-603
CO No.	Course Outcomes
CO-1	Students will know the concepts of JDBC Programming.
CO-2	Students will know the concepts of Multithreading and SocketProgramming.
CO-3	Students will know the concepts of Spring and Hibernate.
CO-4	Students will develop the project by using JSP and JDBC.
CO-5	Students will develop applications in Spring and hibernate

Course Title	Dot Net Framework
CODE	CA-604
CO No.	Course Outcomes
CO-1	To know the concept of software testing.
CO-2	To understand how to test bugs in software.
CO-3	To develop programming logic.

Course Title	Project
CODE	605
CO No.	Course Outcomes
CO-1	Students can express their ideas clearly and effectively, both verbally and in written form.
CO-2	Students can work as a team to achieve common goals.
CO-3	Students are able to make links across different areas of knowledge and to generate, develop and evaluate ideas and information related to the project.
CO-4	Students are able to learn on their own, reflect on their learning and improve upon it.

Course Title	Computer Laboratory Based on 601 and 602
CODE	606
CO No.	Course Outcomes
CO-1	To assess the knowledge of student in Advanced Web Technologies and Advance Java
CO-2	To acquire knowledge on writing computer programs using concept of Advanced Web Technologies and Advance Java
CO-3	To create and manage Applications using Advanced Web Technologies and Advance Java

Rajgad Dnyanpeeths
Anantrao Thopte College, Bhore
DEPARTMENT OF BOTANY

B. Sc. Botany

Programme Outcomes:

Knowledge outcomes:

After completing B.Sc. Botany Programme students will be able to:

- PO1: demonstrate and apply the fundamental knowledge of the basic principles of major fields of biology;
- PO2: Apply knowledge to solve the issues related to plant sciences with the help of computer technology
- PO3: Apply knowledge for conservation of endemic and endangered plant species

Skill outcomes:

After completing B.Sc. Botany Programme students will be able to:

- PO4: collaborate effectively on team-oriented projects in the field of life sciences.
- PO5: communicate scientific information in a clear and concise manner both orally and in writing
- PO6: explain Biodiversity, climate change and plant pathology.
- PO7: apply Biotechnology, Ecology, Genetics and Plant breeding techniques in plant sciences

Generic outcomes:

Students will

- PO10: Have developed their critical reasoning, judgment and communication skills.
- PO11: Augment the recent developments in the field of Molecular and cell Biology, Biotechnology and relevant fields of research and development
- PO12: Enhance the scientific temper among the students so that to develop a research culture and Implementation the policies to tackle the burning issues at global and local level.

Programme Specific Outcomes

- PSO1: Students get acquainted with techniques which are used in plant tissue culture .
- PSO2: Students get conceptual knowledge of entrepreneurship in mushroom cultivation, Biofertilizers and Biopesticides production, plant tissue culture laboratories, Enzyme production, Fermentation, Single cell proteins etc.
- PSO3: Understand the diversity of the plants and structural organization of plants like monocots and Dicot.
- PSO4: Understand plant structures in the context of physiological and biochemical functions of plants.
- PSO5: Students will be well versed with various mechanisms of GMOs and molecular techniques.

Course Outcomes
F. Y. B.Sc. Botany

Course 111: plant life and utilization I

After successfully completing this course, students will be able to:

- CO1: outline cryptogams and phanerogams.
- CO2: Define general characters of cryptogams and Phanerogams.
- CO3: Classify the members of plants groups in to cryptogams and Phanerogams.
- CO4: Describe the Life cycle of plant forms of cryptogams and Phanerogams.
- CO5: Identify lichens and their economic value.
- CO6: Discuss economic importance of algae, fungi and bryophytes.
- CO7: Demonstrate the methods of cultivation of mushrooms.

Course 112: plant morphology and anatomy

After successfully completing this course, students will be able to:

- CO1: Define morphology and anatomy
- CO2: Use knowledge of morphology to identify plant types and inflorescence.
- CO3: Describe plant anatomy.
- CO5: Discuss morphological and anatomical aspects of plants.
- CO6: Explain types of fruits
- CO8: differentiate between types of simple and complex tissues

Course 113: Practical Botany -I

After successfully completing this course, students will be able to:

- CO1: Recognize the live forms of Cryptogamic and Phanerogamic plants.
- CO2: Analyse and describe life cycle pattern of Spirogyra, Agaricus, Riccia
- CO3: Differentiate economic uses of fungi, algae, lichen for food, medicine, industry
- CO4: Explain types of tissues.
- CO5: Explain and demonstrate the Dicot and monocot plants.
- CO6: Illustrate the floral parts, fruits, leaves, inflorescence fruit and their types
- CO7: explain the mushroom cultivation

Course 121: plant life and utilization II

After successfully completing this course, students will be able to:

- CO1: outline pteridophytes and gymnosperms
- CO2: Define general characters of angiosperms
- CO3: Classify the members of plants groups in to Pteridophytes, gymnosperms and angiosperms.
- CO4: Describe the Life cycle of plant forms of Nephrolepis, Cycas.
- CO5: Identify and discuss their economic value of angiosperms
- CO6: Discuss economic importance of Pteridophytes and gymnosperms

Course 122: Principles of plant science

- CO1: define terminology related to molecular biology
- CO2: define and differentiate between physiological processes of plant.
- CO3: Describe physiological processes diffusion osmosis, plasmolysis.
- CO4: describe DNA structure and replication of DNA.
- CO5: Explain Types of chromosomes

S. Y. B.Sc. Botany

BO 231: Taxonomy of Angiosperms and plant ecology

After successfully completing this course, students will be able to:

- CO1: Define plant taxonomy and taxonomic related terminologies.
- CO2: Explain classification systems of angiosperms.
- CO3: Use required data sources for classification of angiosperms.
- CO4: Determine Botanical Nomenclature of angiosperm plants.
- CO5: Recognize ecological plant groups with examples.
- CO6: Explain plant families with examples.
- CO7: Apply proper herbarium methods - collecting, mounting, and keeping records.
- CO8: Execute computer knowledge in plant taxonomy and digital herbarium

BO 232: Plant Physiology

After successfully completing this course, students will be able to:

- CO1: Define the terminologies: Plant water relations, Growth, Transpiration, Ascent of Sap, Plant growth regulators and Nitrogen metabolism.
- CO2: Explain processes of mineral nutrition, absorption of water, ascent of sap, mechanisms of water loss from plants.
- CO3: Demonstrate processes imbibition, Osmosis, Diffusion and Plasmolysis, measure growth by arc auxanometer.
- CO4: Describe seed dormancy and their types.
- CO5: Discuss nitrogen metabolism in plants
- CO6: Explain mechanisms and application of photoperiodism
- CO7: Explain Mechanism of vernalization and concept of flowering.
- CO8: Classify the plants based on Photoperiodism and phytohormones .

BO 241: Plant Anatomy and Embryology

After successfully completing this course, students will be able to:

- CO1: Define terms related to plant Anatomy, Embryology.
- CO2: Describe various tissue systems in plants like epidermal, mechanical and vascular.
- CO3: Interpret the Principles involved in distribution of mechanical tissues.
- CO4: Explain the process of normal and abnormal secondary growth in plants.
- CO5: Differentiate between normal and abnormal secondary growth.
- CO6: Identify the process of pollination and fertilization.
- CO7: Discuss the Structure and development process of male and female gametophyte
- CO8: Illustrate the types of microspores, ovules, embryo, seed and endosperm.

BO 242: Plant Biotechnology

After successfully completing this course, students will be able to:

- CO1: Define the terminologies related to plant biotechnology.
- CO2: Describe the plant tissue culture process.
- CO3: Explain single cell protein
- CO4: Interpret the production of Single cell proteins and biofertilizers.
- CO5: Illustrate the concept of phytoremediation.
- CO6: Describe General method of gene isolation from the plants and their application.
- CO7: Explain Methods of gene, transfer in plants.
- CO8: Illustrate Application of plant genetic engineering and biofuel tech.

BO 233: Practical Paper III

After successfully completing this course, students will be able to:

- CO1: Define the botanical terms to identify the plant families.

CO2: Identify the plant families.

CO3: Draw the floral diagram of plants belonging to specific families.

CO4: Demonstrate physiological experiments, fermentation and fermentation products.

CO5: Calculate LPC leaf protein concentration, DPD

CO6: Describe tests for starch and protein.

CO7: Describe the transpiration under shade sunlight and wind.

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Anantrao Thopte College, Bhor

DEPARTMENT OF CHEMISTRY

B. Sc. Chemistry

Goals :

The Department has formulated three broad educational goals for the undergraduate degree programs:

Chemistry knowledge: To provide students with the basic foundation in Chemistry and allied subjects, the interplay of theory and experiment, and to motivate scientific enthusiasm and curiosity and the joy of learning.

Problem solving skills: To provide students with the tools needed to analyse problems with the skills required to succeed in graduate school, the chemical industry or professional school.

Employment and technical skills: To provide the students with technical skills necessary for successful careers in chemistry and related or alternative careers for which a chemistry foundation can be very useful. These include to a breadth of experimental techniques using modern instrumentation and communication skills (oral and written).

Programme Outcomes :

Knowledge outcome:

After completing B.Sc. Chemistry Programme students will be able to:

PO1: Transfer and apply the acquired fundamental knowledge of chemistry, including basic concepts and principles of 1) organic chemistry, Inorganic chemistry, Physical and Analytical Chemistry; (2) analytic techniques and experimental methods for chemistry to study different branches of chemistry;

PO2: Demonstrate the ability to explain the importance of the Periodic Table of the Elements and represent key aspects of it and its role in organizing chemical information.

Skills Outcomes Professional Skills

After completing B.Sc. Physics Programme students will be able to:

PO3: apply and demonstrate knowledge of essential facts, concepts, laws, principles and theories related to chemistry;

PO4: demonstrate the learned laboratory skills, enabling them to perform qualitative and quantitative analysis of given samples and able to make conclusions on it;

PO5: set procedure and synthesize simple compounds of commercial importance;

PO6: engage in oral and written scientific communication, and will prove that they can think critically and work independently.

PO6: Communicate effectively using graphical techniques, reports and presentations within a scientific environment.

PO7: to recognize problems in chemical science and make strategies to solve it

PO8: Respond effectively to unfamiliar problems in scientific contexts.

PO9: Plan, execute of design experiment, make documentation of it, interpret data at entry level of chemical industry and report the results;

PO10: Integrate and apply these skills to study different branches of chemistry.

Generic Competencies

PO11: The student will acquire knowledge effectively by self-study and work independently, present information in a clear, concise and logical manner and apply appropriate analytical and approximation methods

PO12: The student will learn professionalism, including the ability to work in groups and in society, and apply basic ethical principles.

Program Specific Outcomes

After completing B. Sc. Chemistry, students will be able to

PSO1: Understand the nature and basic concepts of Physical, Organic and Inorganic chemistry;

PSO2: Analyze Organic and inorganic compounds qualitatively and quantitatively;

PSO3: Understand the applications of physical, organic, inorganic and analytical chemistry in pharmaceutical, agriculture and chemical industries;

PSO4: Able to perform experimental procedures as per laboratory manual in the area of physical, Inorganic and organic chemistry;

PSO5: interpretation and synthesis of chemical information and data obtained from chemical and instrumental analysis.

F. Y. B. Sc. Chemistry Course Outcomes

SEMESTER-I

CH- 101: Physical Chemistry

At the end of course student will be able to -

CO1: Chemical Energetics: Students will be able to apply thermodynamic principles to physical and chemical process, Calculations of enthalpy, Bond energy, Bond dissociation energy, resonance energy, Variation of enthalpy with temperature –Kirchoff's equation, Third law of thermodynamic and its applications

CO2: Chemical Equilibrium: Knowledge of Chemical equilibrium will make students to understand, Relation between Free energy and equilibrium and factors affecting on equilibrium constant, Exergonic and endergonic reaction, Gas equilibrium, equilibrium constant and molecular interpretation of equilibrium constant, Van't Hoff equation and its application

CO3: Ionic equilibria: Concept to ionization process occurred in acids, bases and pH scale, Related concepts such as Common ion effect hydrolysis constant, ionic product, solubility Product, Degree of hydrolysis and pH for different salts, buffer solution.

CH- 102: Organic Chemistry

By the end of this course students will able to

CO1: The students are expected to understand the fundamentals, principles, and recent developments in the subject area.

CO2: It is expected to inspire and boost interest of the students towards chemistry as the main subject

CO3: To familiarize with current and recent developments in Chemistry

CO4: To create foundation for research and development in Chemistry

CH- 103: Chemistry Practical Course I

At the end of course student will able to

CO1: Importance of chemical safety and Lab safety while performing experiments in lab.

CO2: Determination of thermo chemical parameters and related concepts;

CO3: Techniques of pH measurements;

CO4: Preparation of buffer solutions

CO5: Elemental analysis of organic compounds (non-instrumental)

CO6: Chromatographic Techniques for separation of constituents of mixtures handle laboratory glassware's, hazardous chemicals safely in laboratory.

SEMESTER-II

CH-201: Inorganic Chemistry

At the end of course student will be able to –

CO1: Atomic Structure: Various theories and principles applied to reveal atomic structure, Origin of quantum mechanics and its need to understand structure of hydrogen atom, Schrodinger equation for hydrogen atom, Radial and angular part of hydrogenic wave functions, Significance of quantum numbers, Shapes of orbital's.

CO2: Periodicity of Elements : Explain rules for filling electrons in various orbitals- Aufbau's principle, Pauli exclusion principle, Hund's rule of maximum multiplicity, Discuss electronic configuration of an atom and anomalous electronic configurations, Describe stability of half-filled and completely filled orbital's, Discuss concept of exchange energy and relative energies of atomic orbital's, Design Skeleton of long form of periodic table, Describe Block, group, modern periodic law and periodicity, Classification of elements as main group, transition and inner

transition elements , Write name, symbol, electronic configuration, trends and properties, Explain periodicity in the following properties in details: Effective nuclear charge, shielding or screening effect; some numerical problems, Atomic and ionic size. , Crystal and covalent radii, Ionization energies, Electro negativity- definition, trend, Pauling electronegativity scale., Oxidation state of elements

CO3: Chemical Bonding: Attainment of stable electronic configurations , Define various types of chemical bonds- Ionic, covalent, coordinate and metallic bond , Explain characteristics of ionic bond, types of ions, energy consideration in ionic bonding, lattice and solvation energy and their importance in the context of stability and solubility of ionic compounds ,Summarize Born-Landé equation and Born-Haber cycle, Define Fajan's rule, bond moment, dipole moment and percent ionic character, Describe VB approach, Hybridization with example of linear, trigonal, square planar, tetrahedral, TBP, and octahedral, Discuss assumption and need of VSEPR theory ,Interpret concept of different types of valence shell electron pairs and their contribution in bonding, Application of non-bonded lone pairs in shape of molecule , Basic understanding of geometry and effect of lone pairs with examples such as ClF_3 , Cl_2O , BrF_5 .

CH- 202: Analytical Chemistry

At the end of course student will be able to –

CO1: Introduction to Analytical Chemistry: Analytical Chemistry –branch of chemistry, Perspectives of analytical Chemistry, analytical problems

CO2: Calculations used in Analytical Chemistry: Calculations of mole, molar concentrations and various units of concentrations which will be helpful for preparation of solution , Relation between molecular formula and empirical formula, Stoichiometric calculation , Define term mole, millimole, molar concentration, molar equilibrium concentration and Percent Concentration. , SI units, distinction between mass and weight, Units such as parts per million, parts per billion, parts per thousand, solution-dilutant volume ratio, function density and specific gravity of solutions.

CO3: Qualitative Analysis of Organic Compounds: Basics of type determination, characteristic tests and classifications, reactions of different functional groups. Separation of binary mixtures and analysis, Elemental analysis -Detection of nitrogen, sulfur, halogen and phosphorous by Lassaigne's test., Purification techniques for organic compounds.

CO4: Chromatographic Techniques – Paper and Thin layer Chromatography: Basics of chromatography and types of chromatography, Theoretical background for Paper and Thin Layer Chromatography.

CO5: pH metry: pH meter and electrodes for pH measurement, Measurement of pH , Working of pH meter, Applications of pH meter.

CH- 203: Chemistry Practical –II

CO1: The practical course is in relevance to the theory courses to improve the Understanding of the concepts.

CO2: It would help in development of practical skills of the students.

CO3: Use of microscale techniques wherever required.

S. Y. B. Sc. Chemistry Course Outcomes

SEMESTER-III

CH-301: Physical and Analytical Chemistry

CO1: Chemical Kinetics:

After studying the Chemical Kinetics student will able to-

1. Define / Explain concept of kinetics, terms used, rate laws, molecularity, order, 2. Explain factors affecting rate of reaction, 3. Explain / discuss / derive integrated rate laws, characteristics, expression for half-life and examples of zero order, first order, and second order reactions, 4. Determination of order of reaction by integrated rate equation method, graphical method, half-life method and differential method, 5. Explain / discuss the term energy of activation with the help of energy diagram., 6. Explanation for temperature coefficient and effect of temperature on rate constant k, 7. Derivation of Arrhenius equation and evaluation of energy of activation graphically, 8. Derivations of collision theory and transition state theory of bimolecular reaction and comparison, 9. Solve / discuss the problem based theory and equations.

CO2: Surface Chemistry:

•Define / explain adsorption, classification of given processes into physical and chemical Adsorption, •Discuss factors influencing adsorption, its characteristics, differentiates types as physisorption and Chemisorption, •Classification of Adsorption Isotherms, to derive isotherms, •Explanation of adsorption results in the light of Langmuir adsorption isotherm, Freundlich's adsorption Isotherm and BET theory, •Apply adsorption process to real life problem. •Solve / discuss problems using theory.

CO3: Errors in Quantitative Analysis:

•Define, explain and compare meaning of accuracy and precision, •Apply the methods of expressing the errors in analysis from results, •Explain / discuss different terms related to errors in quantitative analysis, •Apply statistical methods to express his / her analytical results in laboratory, •Solve problems applying equations.

CO4: Volumetric Analysis:

After studying the Volumetric Analysis student will able to-

1. Explain / define different terms in volumetric analysis such as units of concentration, indicator, equivalence point, end point, standard solutions, primary and secondary standards, complexing agent, precipitating agent, oxidizing agent, reducing agent, redox indicators, acid base indicators, metallochrome indicators, etc., 2. Perform calculations involved in volumetric analysis, 3. Explain why indicator show colour change and pH range of colour change. 4. To prepare standard solution and b. perform standardization of solutions, 5. To construct acid – base titration curves and performs choice of indicator for particular titration. 6. Explain / discuss acid-base titrations, complexometric titration / precipitation titration / redox titration, 7. Apply volumetric methods of analysis to real problem in analytical chemistry / industry.

CH 302: Inorganic and Organic Chemistry

CO1: Molecular Orbital Theory of Covalent Bonding:

After studying the Molecular Orbital Theory student will able to-

1. Define terms related to molecular orbital theory (AO, MO, sigma bond, pi bond, bond order, magnetic property of molecules, etc), 2. Explain and apply LCAO principle for the formation of MO's from AO's., 3. Explain formation of different types of MO's from AO's.

4. Distinguish between atomic and molecular orbitals, bonding, anti-bonding and non-bonding molecular orbitals, 5. Draw and explain MO energy level diagrams for homo and hetero diatomic molecules. Explain bond order and magnetic property of molecule, 6. Explain formation and stability of molecule on the basis of bond order, 7. Apply MOT to explain bonding in diatomic molecules other than explained in syllabus.

CO2: Introduction to Coordination Compounds:

After studying the Introduction to Coordination Compounds student will able to-

1. Define different terms related to the coordination chemistry (double salt, coordination compounds, coordinate bond, ligand, central metal ion, complex ion, coordination number, magnetic moment, crystal field stabilization energy, types of ligands, chelate effect, etc.), 2. Explain Werner's theory of coordination compounds. Differentiate between primary and secondary valency. Correlate coordination number and structure of complex ion, 3. Apply IUPAC nomenclature to coordination compound.

CO3: Aromatic Hydrocarbons:

After studying the aromatic hydrocarbons student will able to-

1. Identify and draw the structures aromatic hydrocarbons from their names or from structure name can be assigned, 2. Explain / discuss synthesis of aromatic hydrocarbons, 3. Give the mechanism of reactions involved. 4. Explain / Discuss important reactions of aromatic hydrocarbon, 5. To correlate reagent and reactions.

CO4: Alkyl and Aryl Halides:

After studying the Alkyl and Aryl Halides student will able to-

1. Identify and draw the structures alkyl / aryl halides from their names or from structure name can be assigned, 2. Explain / discuss synthesis of alkyl / aryl halides, 3. Write / discuss the mechanism of Nucleophilic Substitution (SN1, SN2 and SNi) reactions, 4. Explain / Discuss important reactions of alkyl / aryl halides, 5. To correlate reagent and reactions, 6. Give synthesis of expected alkyl / aryl halides.

CO5: Alcohols, Phenols and Ethers (Up to 5 Carbons):

After studying the Alcohols and Phenols student will able to-

1. Identify and draw the structures alcohols / phenols from their names or from structure name can be assigned, 2. Able to differentiate between alcohols and phenols, 3. Explain / discuss synthesis of alcohols / phenols, 4. Write / discuss the mechanism of various reactions involved. 5. Explain / Discuss important reactions of alcohols / phenols, 6. To correlate reagent and reactions of alcohols / phenols, 7. Give synthesis of expected alcohols / phenols.

CH-303: Practical Chemistry-III

CO1: Chemical Kinetics:

1. Students understand the Acid catalyzed hydrolysis of an ester and calculate the rate constant (k), 2. Students aware about kinetics of reaction, 3. students can calculate energy of activation and order of reaction.

CO2: Inorganic quantitative / qualitative analysis

1. Students perform the quantitative analysis using titration, 2. Students knows the Green Approach concept, 3. Students understand the Separation and Identification of metal ions by Paper Chromatography.

CO3: Organic Qualitative Analysis

1. **Separation of Two Components** from given binary mixture of organic compounds containing mono-functional group (Ex. - carboxylic acid, phenols, amines, amide,

nitro, etc.) and systematic identification of each component qualitatively.

CO4: Organic Preparations

1. Preparation of benzoic acid from ethyl benzoate (Identification and confirmatory Test of $-\text{COOH}$ group, M.P and purity by TLC), 2. Acetylation of primary amine (Green approach) 3. Base catalyzed Aldol condensation (Green approach), 4. Preparation of Quinone from hydroquinone (Confirm the conversion by absence of phenolic $-\text{OH}$ group in product, M.P and purity by TLC).

CO5: pH Metry

To determine equivalence point of neutralization of acetic acid by pH-metric titration with NaOH and to find best indicator for the titration.

CO6: Volumetric Analysis

1. Estimation of Aspirin from a given tablet and find errors in quantitative analysis, 2. Determination of acetic acid in commercial vinegar by titrating with standard NaOH. Express your results as average \pm standard deviation, 3. Determination of Hardness of water from given sample by complexometric titration (Using E.D.T.A.) method and total dissolve solids by conductometry. Express your results as average \pm standard deviation.

Learning Outcome- Practical Chemistry-III

1. Verify theoretical principles experimentally.
2. Interpret the experimental data on the basis of theoretical principles.
3. Correlate theory to experiments. Understand/verify theoretical principles by experiment observations; explain practical output / data with the help of theory.
4. Understand systematic methods of identification of substance by chemical methods.
5. Write balanced equation for the chemical reactions performed in the laboratory.
6. Perform organic and inorganic synthesis and is able to follow the progress of the chemical reaction by suitable method (colour change, ppt. formation, TLC).
7. Set up the apparatus / prepare the solutions - properly for the designed experiments.
8. Perform the quantitative chemical analysis of substances explain principles behind it.
9. Systematic working skill in laboratory will be imparted in student.

SEMESTER-IV

CH-401: Physical and analytical chemistry

CO1: Phase equilibrium:

•Define the terms in phase equilibria such as- system, phase in system, components in system, degree of freedom, one / two component system, phase rule, etc., •Explain meaning and Types of equilibrium such as true or static, metastable and unstable equilibrium, •Discuss meaning of phase, component and degree of freedom, •Derive of phase rule, •Explain of one component system with respect to: Description of the curve, Phase rule relationship and typical features for i) Water system ii) Carbon dioxide system iii) Sulphur system.

CO2: Ideal and real solutions:

•Define various terms, laws, differentiate ideal and no-ideal solutions, •Discuss / explain thermodynamic aspects of Ideal solutions-Gibbs free energy change, Volume change, Enthalpy change and entropy change of mixing of Ideal solution, •Differentiate between ideal and non-ideal solutions and can apply Raoult's law, •Interpretation of i) vapor pressure-composition diagram ii) temperature-composition diagram, •Explain distillation of liquid solutions from temperature-composition diagram, •Explain / discuss azeotropes, Lever rule,

Henry's law and its application., •Discuss / explain solubility of partially miscible liquids-systems with upper critical. Solution temperature, lower critical solution temperature and having both UCST and LCST, •Explain / discuss concept of distribution of solute amongst pair of immiscible solvents, •Derive distribution law and its thermodynamic proof, •Apply solvent extraction to separate the components of from mixture interest, •Solve problem by applying theory.

CO3: Conductometry:

•Explain / define different terms in conductometry such as electrolytic conductance, resistance, conductance, Ohm's law, cell constant, specific and equivalent conductance, molar conductance, Kohlrausch's law, etc. •Discuss / explain Kohlrausch's law and its Applications, Conductivity Cell, Conductivity Meter, Wheatstone Bridge. •Explain / discuss conductometric titrations. •Apply conductometric methods of analysis to real problem in analytical laboratory. •Solve problems based on theory / equations. •Correlate different terms with each other and derive equations for their correlations.

CO4: Colorimetry:

•Explain / define different terms in Colorimetry such as radiant power, transmittance, absorbance, molar, Lambert's Law, Beer's Law, molar absorptivity •Discuss / explain / derive Beer's law of absorptivity. •Explain construction and working of colorimeter. •Apply colorimetric methods of analysis to real problem in analytical laboratory. •Solve problems based on theory / equations. •Correlate different terms with each other and derive equations for their correlations.

CO5: Column Chromatography:

•Explain / define different terms in column chromatography such as stationary phase, mobile phase, elution, adsorption, ion exchange resin, adsorbate, etc. •Explain properties of adsorbents, ion exchange resins, etc. •Discuss / explain separation of ionic substances using resins. •Discuss / explain separation of substances using silica gel / alumina. •Apply column chromatographic process for real analysis in analytical laboratory.

CH-402: Inorganic and Organic Chemistry

CO1: Isomerism in coordination complexes:

After studying the aromatic hydrocarbons student will be able to-

1. Isomerism in coordination complexes, 2. Explain different types of isomerism in complexes.

CO2: Valence Bond Theory of Coordination Compounds:

After studying the aromatic hydrocarbons student will be able to-

1. Apply principles of VBT to explain bonding in coordination compound of different geometries. 2. Correlate no of unpaired electrons and orbitals used for bonding. 3. Identify / explain / discuss inner and outer orbital complexes. 4. Explain / discuss limitation of VBT.

CO3: Crystal Field Theory

After studying the aromatic hydrocarbons student will be able to-

1. Explain principle of CFT. 2. Apply crystal field theory to different type of complexes (Td, Oh, Sq. Pl complexes) 3. Explain: i) strong field and weak field ligand approach in Oh complexes ii) Magnetic properties of coordination compounds on the basis of weak and strong ligand field ligand concept. iii) Origin of colour of coordination complex. 4. Calculate field stabilization energy and magnetic moment for various complexes. 5. To identify Td and Sq. Pl

complexes on the basis of magnetic properties / unpaired electrons. 6. Explain spectrochemical series, tetragonal distortion / Jahn-Teller effect in Cu(II) Oh complexes only.

CO4: Aldehydes and Ketones (aliphatic and aromatic)

After studying the aldehydes and ketones student will able to

1. Identify and draw the structures aldehydes and ketones from their names or from structure name can be assigned. 2. Explain / discuss synthesis of aldehydes and ketones. 3. Write / discuss the mechanism reactions aldehydes and ketones. 4. Explain /Discuss important reactions of aldehydes and ketones. 5. To correlate reagent and reactions of aldehydes and ketones 6. Give synthesis of expected aldehydes and ketones. 7. Perform inter conversion of functional groups.

CO5: Carboxylic acids and their derivatives:

After studying the carboxylic acids and their derivatives student will able to-

1. Identify and draw the structures carboxylic acids and their derivatives from their names or from structure name can be assigned. 2. Explain / discuss synthesis of carboxylic acids and their derivatives. 3. Write / discuss the mechanism reactions carboxylic acids and their derivatives 4. Explain /Discuss important reactions of carboxylic acids and their derivatives. 5. Correlate reagent and reactions of carboxylic acids and their derivatives 6. Give synthesis of expected carboxylic acids and their derivatives. 7. Perform inter conversion of functional groups.

CO6: Amines and Diazonium Salts:

After studying the amines and diazonium Salts student will able to-

1. Identify and draw the structures amines from their names or from structure name can be assigned. 2. Explain / discuss synthesis of carboxylic amines. 3. Write / discuss the mechanism reactions carboxylic amines. 4. Explain /Discuss important reactions of carboxylic amines. 5. To correlate reagent and reactions of carboxylic amines. 6. Give synthesis diazonium salt from amines and reactions of diazonium salt. 7. Perform inter conversion of functional groups.

CO7: Stereochemistry of Cyclohexane:

After studying the aromatic hydrocarbons student will able to-

1. Draw the structures of different conformations of cyclohexane. 2. Define terms such as axial hydrogen, equatorial hydrogen, confirmation, substituted cyclohexane, etc. 3. Convert one conformation of cyclohexane to another conformation and should able to identify governing structural changes. 4. Explain / discuss stability with respect to potential energy of different conformations of cyclohexane. 5. Draw structures of different conformations of methyl / t-butyl monosubstituted cyclohexane (axial, equatorial) and 1, 2 dimethyl cyclohexane. 6. Identify cis- and trans-isomers of 1, 2 dimethyl substituted cyclohexane and able to compare their stability.

CH-403: Practical Chemistry-IV

CO1: Conductometry

a) To determine the cell constant of the given cell using 0.01 M KCl solution and determine dissociation constant of a given monobasic weak acid. b) To investigate the conductometric titration of the following i) Strong acid against strong base ii) Strong base against weak acid.

CO2: Chromatography

1. Separation of binary mixture of cations by Column Chromatography by ion exchange

resins / cellulose. Separation should be confirmed by qualitative test.

CO3: Ideal and Real solutions

1. To study the variation of mutual solubility temperature with % concentration for the phenol - water system 2. To study the effect of added electrolyte on the critical solution temperature of phenol water system and to determine the concentration of the given solution of electrolyte. 3. To obtain the temperature-composition phase diagram for a two component liquid system with maximum (or minimum) boiling point and to determine the maximum (or minimum) boiling point and composition.

CO4: Adsorption

To verify the Freundlich and Langmuir adsorption isotherm for adsorption of acetic acid on activated charcoal.

CO5: Synthesis of Coordination compounds

1. Synthesis of sodium cobaltinitrite (a laboratory chemical) from Co (II) salt and NaNO_2 salts. Students comment on color and magnetic properties of the complex. 2. Synthesis of potassium Tris(oxalate)aluminum (III) using scrap Al metal powder. Students comment on color and magnetic properties of the complex. 3. Synthesis of Tris(acetylacetonate)iron (III) by green chemistry method by reaction between $\text{Fe}(\text{OH})_3$ and acac. Students comment on colour and magnetic properties of the complex. 4. Synthesis of Tris(ethylenediamine)nickel (II) from Ni(II) salt, ethylenediamine and sodium thiosulfate. Students comment on colour and magnetic properties of the complex.

CO6: Inorganic colorimetric investigations

1. Prepare standard solutions of KMnO_4 / CuSO_4 , record their absorbance and Verify Beer's Law and determine unknown concentration. 2. Prepare solution of Fe(III) and SCN of in different molar proportion, record their absorbance and calculate equilibrium constant of $[\text{Fe}(\text{SCN})]^{2+}$ complex. 3. Prepare solution of Fe(III)/Cu(II) and salicylic acid in different molar proportion and determine metal ligand ratio in Fe(III) or Cu(II)–Salicylic acid complex.

Co7: Organic Estimations (any two)

1. Determination of molecular weight: Determination of molecular weight of organic acid by titration against standardized NaOH - a) monobasic acid or b) dibasic acid
2. Estimation of amides: Determine the amount of acetamide in given solution by volumetric method. (Standardization of acid must be performed)
3. Estimation of Ethyl benzoate: To determine the amount of ethyl benzoate in given solution volumetrically. (Standardization of acid must be performed).

Section - C: Industrial Visit

Visit any Chemical / Pharmaceutical / Polymer / Research Institutes / Sugar Factories / waste water treatment plant, etc. and submit report. **Learning Outcomes**

1. Verify theoretical principles experimentally. 2. Interpret the experimental data on the basis of theoretical principles. 3. Correlate the theory to the experiments. Understand / verify theoretical principles by experiment or explain practical output with the help of theory. 4. Understand systematic methods of identification of substance by chemical methods. 5. Write balanced equation for all the chemical reactions performed in the laboratory. 6. Perform organic and inorganic synthesis and able to follow the progress of the chemical reaction.

T. Y. B. Sc. Chemistry Course Outcomes

SEMESTER-V

CH-501: Physical Chemistry- I

CO1: Quantum Chemistry

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 ψ^2 and sketching the wave function 8. Applications to conjugated systems, zero-point energy and quantum tunnelling, Numerical Problems

CO2: Investigation of Molecular structure

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

CO3: Photochemistry

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

CH-502: Analytical Chemistry- I

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 be 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.

CH-503: Physical Chemistry Practical - I

CO1: Refractometry:

1) To determine the specific refractivity's of the given liquids A and B and their mixture and hence determine the percentage composition their mixture C. 2) To determine the molecular refractivity of the given liquids A, B, C and D. 3) To determine the molar refraction of homologues methyl, ethyl and propyl alcohol and show the constancy contribution to the molar refraction by -CH₂ group. 4) Determine the refractive index of a series of salt solutions and determine the concentration of a salt of unknown solution

CO2: Spectrophotometry and Colorimetry:

1) To titrate Cu²⁺ ions with EDTA photometrically. 2) To determine the indicator constant of methyl red indicator 3) To estimate of Fe³⁺ ions by thiocyanate method. 4) Cobalt by using R-nitroso salt method. 5) To determine the order of reaction for the oxidation of alcohol by potassium dichromate and potassium permanganate in acidic medium calorimetrically. 6) Simultaneous determination of Cu²⁺ and Ni²⁺ ions by colorimetry/spectrophotometry method

CO3: Conductometry:

1) Titration of a mixture of weak acid and strong acid with strong alkali. 2) To determine the velocity constant of hydrolysis of ethyl acetate by NaOH solution by conductometric method. 3) To determine the normality of citric acid in given fruit by titrating it against standard NaOH solution by conductometric method. 4) To determine λ_{∞} of strong electrolyte (NaCl or KCl) and to verify Onsager equation. 5) To estimate the amount of lead present in given solution of lead nitrate by conductometric titration with sodium sulphate. 6) To determine the relative strength of monochloro acetic acid and acetic acid conductometrically

CO4: Viscosity: (any one)

1. To determine the molecular weight of a high polymer by using solutions of different concentrations. 2. Determine the radius of glycerol molecule from viscosity measurement.

CO5: Photoflurometry

1. Analysis of Riboflavin from vitamin supplementary capsules / syrup / tablet sample by Photoflurometry

CO6: Table work

1. Analysis of the given vibration-rotation spectrum of HCl(g)

CH-504: Inorganic Chemistry - I**CO1: Molecular Orbital Theory of Coordination Compounds, 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.

CO2: Inorganic Reaction Mechanism

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.

CO3: Chemistry of Transition

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.

CO4: Chemistry of f-block elements, 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.

CO5: Metals, Semiconductors and Superconductors, 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. 15. Discovery and applications of superconductors.

CH-505: Industrial Chemistry - I**CO1: Modern Approach to Chemical Industry**

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

CO2: Manufacture of Basic Chemicals

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

CO3: Sugar and Fermentation Industry

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.

CO4: Soap and detergents

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

CO5: Dyes and Pigments

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

CO6: Industrial visit:

Visit to any one of the Chemical / Pharmaceutical / Polymer / Research Institutes / Sugar Factories / waste water treatment plant, etc. is essential and a systematic report is to be submitted by the student to the Department of Chemistry.

CH-506: Inorganic Chemistry Practical - I**CO1: Gravimetric estimations**

1. Gravimetric estimation of Fe as Fe_2O_3 2. Gravimetric estimation of Ba as BaSO_4 using homogeneous precipitation method. 3. Gravimetric estimation of Nickel as Ni – DMG. 4. Analysis of sodium bicarbonate from mixture by thermal decomposition method. 5. Determination of water of crystallization by thermal decomposition. 6. Analysis of Food/Pharmaceutical sample for ash and sulphated ash example-Aspirin

CO2: Inorganic preparations

Preparation of inorganic complexes and spot tests for metal ions and ligands:

1. Preparation of hexamminenickel(II) chloride, $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$. 2. Preparation of Potassium trioxalatoferrate(III), $\text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$. 3. Preparation of Manganese (III) acetylacetonate, $[\text{Mn}(\text{acac})_3]$. 4. Preparation of tris(glycinato)nickelate(II), $[\text{Ni}(\text{gly})_3]$ - 5. Preparation of Potassium dioxalatocuprate(II), $[\text{Cu}(\text{C}_2\text{O}_4)_2]^{2-}$.

CO3: Inorganic Qualitative Analysis

1. Inorganic Qualitative analysis [1 simple water soluble mixture, 2 mixtures containing borates and 2 mixtures containing phosphates] 2. Limit test for iron, chloride and sulphate

from pharmaceutical raw materials.; OR 2. Qualitative and confirmatory tests of inorganic toxicants of any four ions (Borate, copper, hypochlorite or nitrate or nitrite, Sb or Bi, Iodate, H₂O₂).

CH-507: Organic Chemistry - I

CO1: Polynuclear and Heteronuclear Aromatic Compounds: After studying the polynuclear and heteronuclear aromatic compounds, students will able to

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

CO2: 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

CO3: 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

CO4: 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

CH-508: Chemistry of Biomolecules

CO1: Introduction to molecular logic of life. The student will be 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

CO2: 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.

CO3: Lipids: The student needs to know the types of lipids with examples, structure of lipids, properties of lipids

CO4: 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.

CO5: Enzymes: The student knows the classes of enzymes with subclasses and examples. Enzyme specificity, Equations of enzyme kinetics K_m and its significance, features of various types of enzyme inhibitions, industrial applications of enzymes.

CO6: Hormones: Basic concepts of Endocrinology. Types of Endocrine glands and their hormones. Biochemical nature of hormones. Mechanism of action of lipophilic and hydrophilic hormones.

CH-509: Organic Chemistry Practical-I, Learning Outcomes:

CO1: Separation of Binary Mixtures and Qualitative Analysis:

1. Perform the quantitative chemical analysis of binary mixture, explain principles behind it. 2. Separate, purify and analyze binary water insoluble mixture. 3. Separate, purify and analyze 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.

CO2: 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.

Skills Enhancing Course-I, Choose one out of the two options, A and B.

CH-510 (A): Introduction to Medicinal Chemistry

CO1: Upon completion of the course the student shall be able to understand,

CO1: The basics of medicinal chemistry, biophysical properties, overview of basic concepts of traditional systems of medicine.

CO2: Over view of the overall process of drug discovery, and the role played by medicinal chemistry in this process.

CO13: Biological activity parameters and importance of stereochemistry of drugs and receptors.

CO4: 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

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

CO1: History of polymers., Difference between simple compounds and polymer, Names of polymers, Various ways of nomenclature.

CO2: Difference between natural, synthetic, organic and inorganic polymers, Terms- Monomer, Polymer, Polymerization, Degree of polymerization, Functionality, Number average, Weight average molecular weight, Mechanisms of polymerization.

CO3: Polymerization techniques, Uses & properties of polymers Role of polymer industry in the economy Advantages of polymers.

Skills Enhancing Course-II

CH-511 (A): Environmental Chemistry

CO1: Concepts and Scope of Environmental Chemistry

Students should know:

i. Importance and conservation of environment. ii. Importance of biogeochemical cycles

2 CO2: Hydrosphere and Water Pollution

Students should know:

i. Water resources ii. Hydrological Cycle iii. Organic and inorganic pollutants iv. Water quality parameters

CO3: Analytical Techniques in water Analysis

Water quality parameters and standards, domestic water quality parameters, surface water, sampling, preservation, Monitoring techniques and methodology (pH, conductance, DO, ammonia, nitrate and nitrite, Cl, F, CN, Sulfide, sulphate, phosphate, total hardness, boron, metals and metalloids- As, Cd, Cr, Cu, Fe, Pb, Mn, Hg (Exclude polarographic and AAS methods), COD, BOD, TOC, phenols, pesticides, surfactants, tannins and lignins, E. Coli, Case studies of water pollution.

CO4: Water pollution and treatment methods

Water pollutants, Eutrophication, Waste water treatment (domestic waste water, aerobic treatment, anaerobic treatment, upflow aerobic sludge bed, industrial waste water treatment, drinking water supplies, Trace elements in water, chemical speciation (Cu, Pb, Hg, As, Se, Cr)

CH-511 (B): Cheminformatics

CO1: Introduction to Cheminformatics

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 CO2: Representation of Molecules and Chemical Reactions:

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 be able to identify these representation methods with understanding. 4. Students should be able to read these representation methods for basic examples.

CO3: Searching Chemical Structures:

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 be able to correlate the necessity of input methods and the expected outcomes for the set of chemicals 4. Students should be able to understand data interpretation using these methods for basic or representative molecules.

CO4: Applications of Cheminformatics:

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 be 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

Semester-VI

CH-601: Physical Chemistry-II

CO1: Electrochemical Cells

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 7. Nernst Equation for theoretical determination of EMF 8. Types of Reversible electrodes: Metal-metal ion electrodes, Amalgam electrodes, Gas electrodes, Metal-metal insoluble salt electrodes, Oxidation-reduction electrodes with respect to examples, diagram, representation, construction, working (electrode reactions) and electrode potential. 9. Sign convention for electrode potentials and Electrochemical series 10. Standard electrode potentials, 11. Types of concentration cells: Concentration cells without and with transference Concentration cells with liquid junction potential 12. Liquid junction potential and salt bridge 13. Applications of emf measurements: 1. Determination of pH of a solution by using hydrogen electrode, quinhydrone electrode and glass electrodes 2. Potentiometric titrations: i) Acid-base titrations, (ii) Redox titrations and (iii) Precipitation 14. Primary Batteries: Dry Cells, alkaline batteries with respect to construction, diagram and working 15. Secondary Batteries: Nickel-cadmium, Lithium-ion batteries, the lead acid battery with respect to construction, diagram and working 16. Applications for Secondary Batteries 17. Fuel Cells: Types of fuel cells, advantages, disadvantages of these fuels cells, comparison of battery Vs fuel cell 18. Problems

CO2: Crystal structure

After studying this topic students are expected to know and understand:

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, 10. Problems

CO3: Nuclear Chemistry

After studying this topic students are expected to know

1. Radioactivity 2. Types and properties of radiations: alpha, beta and gamma 3. Detection and Measurement of Radioactivity: Cloud chamber, Ionization Chamber, Geiger-Muller Counter, Scintillation Counter, Film Badges 4. Types of radioactive decay: α - Decay, β -Decay and γ -Decay 5. The Group Displacement Law, Radioactive Disintegration Series 6. Kinetics of Radioactive Decay, Half-life, average life and units of radioactivity 7. Energy released in nuclear reaction: Einstein's equation, Mass Defect, Nuclear Binding Energy, 8. Application of

radioisotopes as a tracer: Chemical investigation- Esterification, Friedel - Craft reaction and structure determination w.r.t PCl_5 , Age determination use of tritium and C^{14} dating. 9. Solve the problems based on this topic

CH-602: Physical Chemistry-III

CO1: Colligative properties of dilute solutions

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.

CO2: Kinetics of Reactions in the Solid State:

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

CO3: Electronic structure and macroscopic properties

1. Cohesive Energy of ionic crystals based on coulomb's law and Born Haber Cycle 2. Correspondence between energy levels in the atom and energy bands in solid 3. Band structure in solids – Na , Ca and diamond 4. Conductors and insulators – Its correlation with Extent of energy in energy bands 5. phenomena of photoconductivity 6. Semiconductors – Role of impurity in transformation of insulator into semiconductor 7. Temperature dependant conductivity semiconductors 8. Cohesive Energy in metals 9. Numericals based on cohesive energy

CO4: Polymers

After studying this topic students are expected to know

- 1) History of polymers. 2) Classification of polymers 3) Chemical bonding & Molecular forces in Polymer 4) Molecular weight of polymers 5) Practical significance of polymer molecular weights 6) Molecular weight determination

CH-603: Physical Chemistry Practical-II

CO1: Potentiometry

- 1) To determine the PK_a value of given monobasic weak acid by potentiometric titration. 2) To determine the formal redox potential of $\text{Fe}^{2+}/\text{Fe}^{3+}$ system potentiometrically. 3) To determine the amount of NaCl in the given solution by potentiometric titration against silver nitrate. 4) To determine the solubility product and solubility of AgCl potentiometrically using chemical cell. 5) Estimate the amount of Cl^- , Br^- and I^- in given unknown halide mixture by titrating it against standard AgNO_3 solution (mixture of any two ions). 6) To prepare standard 0.2 M Na_2HPO_4 and 0.1 M Citric acid solution, hence prepare four different buffer solutions using them. Determine the pH value of these and unknown solution. 7) To determine the composition of Zinc ferrocyanide complex potentiometrically 8) To determine the standard electrode potentials of Cu and Ag electrodes and to determine the EMF of a concentration cell.

CO2: pH metry

- 1) To determine the degree of hydrolysis of aniline hydrochloride. 2) To determine the dissociation constant of oxalic acid by pH-metric titration with strong base. 3) Determination

of P_{ka} of given weak acid by pH metry titration with strong base 4) To determine the acid and base dissociation constant of an amino acid and hence the isoelectric point of an acid. 5) pH metric titration of strong acid against strong base by pH measurement and hence determine the concentration and strength of strong acid.

CO3: Radioactivity

1) To determine plateau voltage of the given G M counter. 2) To determine the resolving time of GM counter. 3) To determine E_{max} of beta particle

CO4: Colligative properties

1. To determine the molecular weight of solute by depression in freezing point method 2. To study the association of Benzoic acid in benzene by Beckmann Method 3. Determine the molecular weight of given electrolyte and non-electrolyte by Landsberger's method and to study the abnormal molecular weight of electrolyte

CO5: Turbidometry:

1. Determination of SO_4^{2-} and Cl^- by turbidimetric method (turbidimetric titration or calibration curve method) 2. To determine the molecular weight of a given polymer by turbidometry

CO6: Table work

1. Analysis of crystal structure from X-ray diffraction spectra of any two compounds (Calculation d, lattice constant, crystal volume and density, and assigning planes to peaks using JCPDS data)

CH-604: Inorganic Chemistry -II

CO1: Organometallic Chemistry

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

CO2: Homogeneous and Heterogeneous catalysis

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.

CO3: Bioinorganic Chemistry, A student should:

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 O_2 transport and storage. vii. Understand the toxicity of CN^- and CO binding to Hb. viii. Draw the structure of Vit. B_{12} and give its metabolism.

CO4: Inorganic Polymers, A student should be able to:

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.

CO5: Inorganic solids/ionic liquids of technological importance, A student should know:

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,

CH-605: Inorganic Chemistry -III

CO1: Acid–Base and Donor–Acceptor Chemistry, 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. **Reference:** Inorganic chemistry, Gary L Messler and Donald A Tar, Third Ed, Pearson publisher, pages: 67-178, 183 – 208.

CO2: Ionic Solids, A student should:

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.

CO3: Chemistry of Zeolites, A student should:

1. Different Zeolite Framework Types and their classification 2. Zeolite synthesis and their structure 3. Application of zeolites

CO4: Introduction to Nanochemistry, A student should:

1. Various methods of nanoparticle synthesis 2. Stabilization of Nanoparticles in solution 3. Properties and Application of Nanoparticles 4. Know about carbon nanotube and its application

CO5: Chemical Toxicology, A student should be able -

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.

CH-606: Inorganic Chemistry Practical-II

CO1: Volumetric Estimations

1. Analysis of Phosphate (PO_4^{3-}) from Fertilizer. 2. Analysis of Iodine from Iodized salt. 3. Strength of medicinal H_2O_2 . 4. Analysis of Calcium from milk powder. 5. Analysis of Cu from Cu-Fungicide.

CO2: Flame Photometry

1. Estimation of Na by flame photometry by calibration curve method. 2. Estimation of Na by flame photometry by regression method. 3. Estimation of K by flame photometry by calibration curve method. 4. Estimation of K by flame photometry by regression method.

CO3: Column Chromatography

1. Purification of water using cation/anion exchange resin and analysis by qualitative analysis /Conductometry.

CO4: Nanomaterial synthesis

1. Synthesis of Silver nanoparticles. 2. Synthesis of ZnO nanoparticles.

CO5: Verification of periodic trends using solubility of alkaline earth metal hydroxides Ca(OH)_2 , Mg(OH)_2 , Cr(OH)_2 , Ba(OH)_2 .

CO6: Synthesis of amine complexes of Ni(II) and its ligand exchange reaction (bidentate ligands like acac, DMG, Glycine) by substitution method. **OR**

Determination of the Metal to ligand ratio (M : L) in complexes.

CO7: Solvent free microwave assisted one pot synthesis of phthalocynin copper (II) complex.

OR Fenton reaction: Degradation of H_2O_2 using Fe catalyst.

CO8: Table work: Band gap calculation for the nanomaterial TiO_2 / SnO_2 / ZnO from its electronic spectra (UV-Visible).

CH-607: Organic Chemistry-II**Learning Outcomes**

CO1: Organic Spectroscopic Methods in Structure Determination. (Chapter 1-5) 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).

CO2: Students should be able to learn

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

CH-608: Organic Chemistry-III**CO1: Retrosynthetic Analysis and Applications**

Introduction, Different terms used – Disconnection, Synthons, Synthetic equivalence, FGI, TM. One group disconnection, Retrosynthesis and Synthesis of target molecules:

Acetophenone, Crotonaldehyde, Cyclohexene, Benzylbenzoate, and Benzyl diethyl malonate.

CO2: Organic Reaction Mechanism and Synthetic Applications

1. Chemistry of reactive intermediates (carbocations, carbanions, free radicals, carbenes, nitrenes, benzyne etc...); 2. Wolff rearrangement (Step up), 3. Hofmann rearrangement (Step down), 4. Simmons-Smith reaction, 5. Michael reaction, 6. Wittig reaction and McMurry

reaction, 7. Diels-Alder reaction, 8. Functional group interconversions and structural problems using chemical reactions.

CO3: Reagents in Organic Synthesis

Students study about Reagents- Preparation and Applications of following reagents.

Reducing Reagents: Lithium aluminium hydride LiAlH_4 , NaBH_4 , DIBAL-H, $\text{Li}(\text{tBuO})_3\text{AlH}$ & Raney Nickel. and **Oxidizing Reagents:** 1. DMSO either with DCC or Ac_2O , Dess Martin reagent, Osmium tetroxide, Selenium dioxide- (SeO_2) , DDQ.

CO4: Natural Products

Terpenoids: Introduction, Isolation, Classification. Citral- structure determination using chemical and spectral methods, Synthesis of Citral by Barbier and Bouveault Synthesis.

Alkaloids: Introduction, extraction, Purification, Some examples of alkaloids and their natural resources. Ephedrine- structure determination using chemical methods. Synthesis of Ephedrine by Nagai.

CH-609: Organic Chemistry Practical-II

Learning Outcomes:

CO1: 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, $\text{C}\equiv\text{C}$ and $\text{C}\equiv\text{N}$, 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 ^1H NMR spectra. 7. Interpret elemental analysis technique

CO2: 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.

CO3: 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.

CO4: 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

Skill Enhancing Course-III Choose one out of the two options, A and B.

CH-610 (A): Chemistry of Soil and Agrochemicals

After studying this course, student is expected to

CO1: Understood various components of soil and soil properties and their impact on plant growth, Understood the classification of the soil, Explores the problems and potentials of soil and decide the most appropriate treatment for land use.

CO2: Understood the Reclamation and management of soil physical and chemical constraints. Useful in making decisions on nutrient dose, choice of fertilizers and method of application etc. practiced in crop production.

CO3: Got experience on advanced analytical and instrumentation methods in the estimation of soil, Understood various Nutrient management concepts and Nutrient use efficiencies of major and micronutrients and enhancement techniques.

CO4: Proper understanding of chemistry of pesticides will be inculcated among the students, Imparts knowledge on different pesticides, their nature and, mode of action and their fate in soil so as to monitor their effect on the environment.

CH-610 (B) Introduction to Forensic Chemistry

After studying this paper the students will know –

CO1: The forensic identification of illicit liquors., The classification and characteristics of the narcotics, drugs and psychotropic substances.

CO2: The menace of designer drugs, the methods of identifying of narcotics, drugs and psychotropic substance.

Skill Enhancing Course-IV Choose one out of the two options, A and B.

CH-611(A): Analytical Chemistry-II

After completion of the course student should able to

CO1: 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.

CO2: 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.

CO3: Explain different principles involved in the analyses using solvent extraction, basics of instrumental chromatography, HPLC, GC, and atomic spectroscopic techniques, Perform quantitative calculations depending upon equations students has studied in the theory. Furthermore, student should able to solve problems on the basis of theory, Discuss / Describe procedure for different types analyses included in the syllabus.

CO4: 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, Demonstrate / explain theoretical principles with help of practical, Design analytical procedure for given sample, Apply whatever theoretical principles he has studied in theory during practical in laboratory.

CH-611 (B): Chemistry of Cosmetics and Perfumes

CO1: Chemical composition, preparation and uses of some cosmetics

A general study including chemical composition, preparation and uses of the following: Hair dye, hair spray, shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel,

creams (cold, vanishing and shaving creams), Eye make-up (Mascara, Eyeshadow, Eyeliner, Eyebrow pencil), Antiperspirants,

CO2: Chemistry of Perfumes and fragrances

History of perfume, classification sources of fragrance, Development and role of natural products in cosmetics, Extraction of Essential oils and their importance and uses in cosmetic industries with reference to Chemistry of - Eugenol, Geraniol, sandalwood oil, eucalyptus, rose oil, phenyl ethyl alcohol, Jasmone, Civetone, Muscone.

CO3: Rules and regulations for cosmetic industry

Understanding of regulations of Central Drugs Standard Control Organization, India Cosmetic Regulation, Steps for process of cosmetic registration in India

CO5: Projects: (students can choose any one of the following projects and submit a project report at the end of semester for evaluation)

1. Preparation of talcum powder.
2. Preparation of shampoo.
3. Preparation of enamels.
4. Preparation of hair remover.
5. Preparation of face cream.
6. Preparation of nail polish and nail polish remover.
7. Preparation of Emulsified and solid fragrances.
8. Isolation of Simple Floral fragrances and Alcoholic fragrances solution.

M. Sc. Organic Chemistry

Goals :

The Department has formulated three broad educational goals for the undergraduate degree programs:

Chemistry knowledge: To provide students with the advanced knowledge in Organic Chemistry and allied subjects, the interplay of theory and experiment, and to motivate scientific enthusiasm and curiosity and the joy of learning.

Problem solving skills: To provide students with the tools needed to analyse problems with the skills required to succeed in graduate school, the chemical industry or professional school.

Employment and technical skills: To provide the students with technical skills necessary for successful careers in chemistry and related or alternative careers for which a advanced chemistry foundation can be very useful. These include to a breadth of experimental techniques using modern instrumentation and communication skills (oral and written).

Programme Outcomes :

Knowledge outcome:

After completing M.Sc. Organic Chemistry Programme students will be able to: PO1: develop the knowledge and understanding of essential facts, concepts, principles and theories of the analytical chemistry

PO2: do literature survey and apply it to enhance their conceptual knowledge that will be apply for solving problems in day to day life or chemical industry or at place of work

Skills Outcomes - Professional Skills

After completing M.Sc. Organic Chemistry students will be able to:

PO3: improve the ability to define the problem and find out its solution

PO4: use research based knowledge and research methods including design of experiment, analysis, interpretation of data and make conclusions

PO5: select and apply appropriate method of chemical analysis and understand the limitations of methods

PO6: apply scientific knowledge to perform laboratory experiments and its documentation, able to write effective report, make and give its effective presentation

PO7: explain the impact of chemical pollutants on environment and ecosystem PO8: effectively use Good Laboratory Practices (GLPs) and understand

laboratory safety precautions

PO9: plan, execute of design experiment, make documentation of it, interpret data at entry level of chemical industry and report the results;

PO10: integrate and apply these skills to study different branches of chemistry.

Generic Competencies

PO11: The student will acquire knowledge effectively by self-study and work independently, present information in a clear, concise and logical manner and apply appropriate analytical and approximation methods

PO12: The student will learn professionalism, including the ability to work in groups and in society, and apply basic ethical principles.

Programme Specific Outcomes :

After completing M.Sc. Organic Chemistry, students will be able to

PSO1: demonstrate knowledge and understanding of molecular spectroscopy for molecular structure determination;

PSO2: apply theoretical and practical understanding of advanced analytical instruments for analysis of inorganic materials, biological substances, micronutrients, pollutants;

PSO3: formulate hypotheses, proposals and predictions and design and undertake experiments and projects in a safe and responsible;

PSO4: take research work at the higher degree level in the field of nanotechnology, analytical chemistry and material science.

Course Outcomes :**M.Sc. Part-I Semester-I****CHP-110, Physical Chemistry-I**

At the end of course student should able to

CO1: describe discovery of atom with different models and also physical properties of matter and its study and rate of reaction.

CO2: relate classical mechanics and quantum mechanics. And differentiation between order of reactions.

CO3: illustrate the difference between molecular thermodynamics and classical thermodynamics.

CO4: solve the derivations regarding quantum mechanics, thermodynamics, chemical kinetics and molecular thermodynamics.

CO5: interpret and discuss about the numerical based on theory.

CO6: recall the concepts of quantum mechanics, thermodynamics, chemical kinetics and molecular thermodynamics.

CO7: derive the statistical and kinetics equations.

CO8: present the quantum mechanical based problems.

CHI-130, Inorganic Chemistry-I,

At the end of course student should able to -

CO1: recall symmetry, group multiplication table, periodic table, periodic trends

CO2: list symmetry elements, types of planes, allotropes and their uses.

CO3: describe symmetry operations, hydrides, solutions in liq. Ammonia, organometallic compounds, intercalation compounds

CO4: discuss character table, SALC, molecular sieves, crown ethers, oxoanions of nitrogen,

CO5: explain point group, boron hydrides, oxy-acids and oxoanions of halogen, structure and bonding.

CO6: classify molecules into point groups and planes, hydrides, carboranes. CO7: derive the character table and SALC equation for different point groups. CO8: draw structures of different compounds of s & p block elements.

CHO – 150 Organic Chemistry-I,

By the end of this course students will able to

CO1: define the terms related to Organic Reactions such as Aliphatic Nucleophilic, Aromatic electrophilic and Nucleophilic Substitution Reactions

CO2: list Different factors responsible for reactivity of organic compounds in Addition

reactions to Unsaturated compounds

CO3: recall the information about acidity Basicity and Aromaticity CO4: explain the Elimination reactions

CO5: solve the chemical Reactions for Aliphatic Nucleophilic, Aromatic electrophilic and Nucleophilic Substitution Reaction

CO6: classify the organic reactions like substitution, Addition and elimination Reactions.

CO7: categorize different nucleophiles Electrophiles and Bases. CO8: judge what type of reagent need for the organic Conversion

CHG – 190, General Chemistry-I

SECTION-I: Theory Course

CO1: Introduction to Solid State of Matter

At the end of course student will understand

1. Bonding in solids – band theory 2. Electronic conductivity 3. Semiconductors, photoconductivity 4. Non-stoichiometry, defects and types of defects in solids 5. Ionic conductivity and their applications 6. Superconductivity and theory of superconductivity 7. Method of synthesis of solids

CO2: Chemical Mathematics

At the end of course student will understand

1. Functions

Differential and integral calculus, limits, derivatives, physical significance, basic rules of differentiation, maxima and minima, application in chemistry, exact and inexact differentiation, Taylor and McLaurin Theorem, curve sketching, partial differentiation, rules of integration, separation of variable, substitution, partial function method to solve to indefinite integrals in chemistry.

2. Differential Equations

Separation of variables, homogeneous, exact, linear equations of second order, series solution method.

3. Vectors Matrices, and Determinants

Vectors, dot, Cross and triple products, introduction to matrix algebra, addition and multiplication of matrices, inverse, adjoints and transport of matrices, unit and diagonal matrices.

CO3: Introduction to Chemical Biology-I

The goal of this course is to introduce students to fundamental concepts in Chemical Biology and methods of chemistry used to solve problems in molecular and cell biology.

After completion of this course, successful students will:

1) Students will be able to explore new areas of research in both chemistry and allied fields of science and technology. 2) Students will be able to function as a member of an interdisciplinary problem-solving team. 3) To impart the student's thorough idea in the chemistry of carbohydrates, amino acids, proteins and nucleic acids etc. 4) Be able to describe the chemical basis for replication, transcription, translation and how each of these central processes can be expanded to include new chemical matter. 5) Develop skills to critically read the literature and effectively communicate research in a peer setting.

SECTION-II: Practical Course

At the end of course student will understand

CO1: Inorganic Material Analysis, Synthesis and Applications

1. Determination of Silica and Manganese from pyrolusite ore. 2. Determination of Aluminum and Silica from Bauxite ore. 3. Determination of silica and iron from hematite ore. 4. Determination of copper and iron from Chalcopyrite ore. 5. Determination of tin and lead from solder alloy. 6. Determination of iron and chromium from stainless steel alloy. 7. Determination of copper and nickel from cupranickel alloy. 8. Synthesis of ZnO from zinc oxalate - precursor method and determine band gap by absorption spectroscopy 9. Synthesis of TiO₂ TiCl₄ or Ti-Isopropoxide by Sol-gel method and determine band gap by absorption spectroscopy 10. Synthesis of Colloidal silver nanoparticles and determine band gap by absorption spectroscopy 11. Synthesis of Fe₂O₃ nanoparticles sol gel/coprecipitation/hydrothermal (any one method) 12. ZnO, TiO₂, Fe₂O₃ nanoparticles powder XRD, SEM, TEM (at least one spectral analysis should be done) 12. Removal and kinetics of photocatalytic dyes, degradation (methylene blue) by ZnO TiO₂ photocatalysis 13. Study of adsorption of phosphate ion on alfa-Fe₂O₃ (Ref-2)

CO2: Chemical Biology-I Practical

1. Statistical treatment of experimental data (calculation of mean and standard deviation for given data and least square method for calibration curve method) –
1. Preparation of biological buffers. 2. Qualitative analysis of carbohydrates 3. Qualitative analysis of Lipids 4. Qualitative analysis of amino acids 5. Paper chromatographic / TLC separation of mixture of amino acids and their detection 6. Paper chromatographic separation of mixture carbohydrates and their detection 7. Quantitative estimation of Glucose by dinitro salicylic acid by using calorimetric method 8. Quantitative estimation of proteins by Lowry's method 9. Kjeldahl method of Protein Determination 10. Saponification number of fats 11. Iodine value of oil 12. Isolation Quantitative estimation of DNA by Diphenyl amine method 13. Determination of Inorganic Phosphate in Biological Samples

CHP-107: Basic Practical Chemistry – I

At the end of course student will understand

Sec-I: CO1: Physical Chemistry Practical

1. Statistical treatment of experimental data (calculation of mean and standard deviation for given data and least square method for calibration curve method) (compulsory) 2. Kinetic decomposition of diacetone alcohol by dilatometry. 3. Determination of an order of a reaction. 4. Brönsted primary salt effect. 5. Kinetics of oxidation of ethanol by K₂Cr₂O₇ 6. Determination of surface excess of amyl alcohol or TX-100 surfactant by Capillary rismethod. 7. Determination of molecular weight by steam distillation. 8. Glycerol radius by viscosity. 9. Partial Molar Volume (Polynometry) Determination of the densities of a series of solutions and to calculate the molar volumes of the components. 10. Simultaneous determination of Ni and Co by spectrophotometry 11. Simulations determination of KMnO₄ and K₂Cr₂O₇ by spectrophotometry 12. To study the adsorption of certain dyes such as methyl violet, picric acid or malachite green on charcoal 13. To determine the indicator constant of bromocresolpuple by half height method 14. Estimation of Cu(II) by titration with Na₂ EDTA by colorimetry 15. a. Determination of energy of n to Π^* transition in acetone and study of effect of solvent on energy of this transition by recording absorbance spectra in n-hexane

and water. b. To study the effect of the extended conjugation on the λ_{max} of p-nitro phenol by recording spectrum in acidic and alkaline medium (Ref-8). 10. Estimation of Mn in tea leaves by NAA. 11. Half-life of a radioactive nuclide and counting errors. 12. Determination of E-max of β radiation and absorption coefficients in Al.

Sec-II: CO2: Organic Chemistry

Introduction to Laboratory Safety: Meaning of safety signs on container of chemicals, safety handling of chemicals, MSDS sheets: Detailed explanation at least for 4 different types of substances (e.g. nitric acid, benzene, potassium dichromate, bromine, etc.), Handling of glassware's and care to be taken, handling of organic flammable as well as toxic solvents in laboratory, use of safety goggles, shoes and gloves, fire extinguisher and its use, action to be taken in accidental cases e.g. cleaning of acid spill over, use eye wash station and bath station in emergency, etc. (compulsory)

Part-I: Purification Techniques a) Purification of **two** organic solids by recrystallization using solvents other than water b) Purification of **two** organic liquids by upward/downward/traditional distillation technique c) Column Chromatography technique should be performed for any one of the following preparation d) Sublimation by Cold Thumb Method e) Thin Layer Chromatography technique **two mixtures**

Part-II: Introduction to Green Chemistry Concept of green chemistry, twelve principals of green chemistry, applications of green chemistry for sustainable development, Atom economy, monitoring of reaction using TLC. 1. Preparation of Schiff's bases in aqueous medium. 2. Preparation of dihydropyrimidinone under solventfree conditions 3. Preparation of acetanilide from aniline and acetic acid using Zn dust.

M.Sc. Part-I Semester-II

CHP-210, Physical Chemistry-II,

SECTION – I, Molecular Spectroscopy

CO1: Microwave Spectroscopy: Types of molecules on the basis of moment of inertia and rotational spectra of di- and poly atomic molecules.

CO2: Infra-red Spectroscopy: The vibrating diatomic molecule, harmonic and Anharmonic oscillator, The diatomic vibrating rotator, breakdown of the Born-Oppenheimer approximation, The vibrations of polyatomic molecule, Fourier transform spectroscopy and its advantages, The carbon dioxide laser, Applications.

CO3: Raman Spectroscopy: Quantum and classical theory of Raman effect, pure rotational Raman spectra, vibrational Raman spectra, polarization of light and Raman effect, structure determination from Raman and Infra-red spectroscopy, applications.

CO4: Electronic Spectroscopy of molecules: Electronic spectra of diatomic molecules - The Born- Oppenheimer approximation, Vibrational coarse structure, Frank- Condon principle, dissociation energy and dissociation product, Rotational fine structure of electronic-vibration transition, The forttrat diagram, Pre-dissociation, molecular photoelectron spectroscopy.

CO5: Mossbauer Spectroscopy: Principle, Instrumentation and Applications of Mossbauer Spectroscopy.

SECTION – II, Nuclear and Radiation Chemistry

CO1: Radioactivity: Types of radioactive decay, general characteristics of radioactive decay, decay kinetics, general expression for the activity of a daughter nuclide, Geiger-Nuttall's law, α -decay: A problem in classical physics, Internal conversion and the Auger effect.

CO2: Elements of Radiation: Chemistry: Interaction of radiation with matter, interaction of γ radiation with matter, units for measuring radiation absorption, Radiation dosimetry, Radiolysis of water, free radicals in water radiolysis, Radiolysis of some aqueous solutions.

CO3: Nuclear Fission: The discovery of nuclear fission, the process of nuclear fission, fission fragments and their mass distribution, charge distribution, Ionic charge of fission fragments, fission energy, M. Sc. fission cross-section and threshold, fission neutrons, theory of nuclear fission, Neutron evaporation and spallation.

CO4: Applications of Radioactivity: Typical reaction involved in the preparation of radioisotopes, The Szilard- Chalmers reaction, Radiochemical principles in the use of tracers, Isotopes in elucidating reaction mechanism and structure determination, physico-chemical research - The solubility of a sparingly soluble substance, surface area of a powder or precipitate rates of diffusion, Analytical applications- Isotope dilution analysis, Neutron activation analysis, Radiometric titrations, Medical Applications-Thyroiditis, Assessing the volume of blood in a patient, Industrial applications thickness measurements and control, friction and wear out, gamma Radiography

CHI-230, Inorganic Chemistry-II,

SECTION-I Coordination Chemistry

At the end of course student should be able to -

CO1: 1. Student should be able to find out the no of microstates and meaningful term symbols, construction of microstate table for various configuration

CO2. Hund's rules for arranging the terms according to energy.

CO 3. Student should understand interelectronic repulsion.

CO 4. Student should know the concept of weak and strong ligand field.

CO 5. Student able to find out splitting of the free ion terms in weak ligand field and strong ligand field.

CO 6. To draw correlations diagram for various configurations in Td and Oh ligand field.

CO 7. Student should know basic instrumentation and selection rules and relaxation in rules.

CO 8. Student should know basic d-d transition, d-p mixing, charge transfer spectra.

CO 9. Interpretation of electronic spectra for spin allowed oh and td complexes using Orgel diagram.

CO 10. Understand the concept of spectro chemical series and Nephelauxetic series.

CO 11. Should be able to solve numerical based on crystal field parameters.

CO 12. Understand the various terms involved in magnetochemistry.

CO 13. Various phenomena of magnetism and their temperature dependence.

CO 14. Various experimental methods to find out magnetic moment.

CO 15. Understand the various Quenching of orbital angular momentum.

Section-II: Bioinorganic Chemistry

- 1) Importance of bioinorganic chemistry.
- 2) Role of metals in Metalloprotein and metalloenzymes.
- 3) Similarities in coordination theory for metal complexes and metal ions complexed with biological ligands.
- 4) Importance and transport of metal ions.
- 5) Passive transport metal ions by ionophores and gramicidin.
- 6) Mechanism for active transport of Na^+ and K^+
- 7) Nerve impulse generation in rod cell of retina.
- 8) Importance and function of Ca, Fe and Mg in metalloprotein
- 9) Catalytic role of Mn in photosynthesis

CHO – 250, Organic Chemistry-II,

By the end of this course students will be able to

- CO 1. MOT and will be able to extend this in predicting reaction mechanism and stereochemistry of electrocyclic reactions.
- CO 2. The concepts in free radical reactions, mechanism and the stereochemical outcomes.
- CO 3. The basic principle of spectroscopic methods and their applications in structure elucidation of organic compounds using given spectroscopic data or spectra.

CHG – 290, General Chemistry-II,

SECTION-I: Theory Course

By the end of this course students will be able to

Elective Option-A: Material Characterization Technique

At the end of course student will understand / able to explain

- CO 1. Different characterization technique of solids.
- CO 2. Principle of XRD, instrumentation of powder XRD, Bragg's law, applications of XRD for crystal structure determination, numerical problems.
- CO 3. Principle of SEM, instrumentation of SEM and interpretation of surface morphology of solid from SEM.
- CO 4. Principle of TEM, instrumentation of TEM and interpretation of TEM images.
- CO 5. Basics of X-rays, Principle of XRF, types of XRF, instrumentation, qualitative and quantitative analysis, numerical.

Elective Option - B: Organometallic and Inorganic Reaction Mechanism

At the end of course students will be able to explain

- CO 1. Valence electron count, back bonding in organometallics, spectral characterization of organometallic compounds.
- CO 2. Catalytic reaction involving organometallic compounds and mechanism of these reactions
- CO 3. Types of reaction involving organometallic compounds
- CO 4. Types of reactions in coordination compounds, inert and labile complexes, substitution reactions in coordination complexes and their mechanism, stereochemistry of reaction, kinetics of reactions.

Elective Option - C: Introduction to Chemical Biology-II

The goal of this course is to introduce students to fundamental concepts in Chemical Biology and methods of chemistry used to solve problems in molecular and cell biology.

After completion of this course, successful students will:

CO 1) Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.

CO 2) Students will be able to function as a member of an interdisciplinary problem solving team.

CO 3) To impart the student's thorough idea in the chemistry of carbohydrates, amino acids, proteins and nucleic acids etc.

CO 4) Be able to describe the chemical basis for replication, transcription, translation and how

each of these central processes can be expanded to include new chemical matter.

CO 5) Develop skills to critically read the literature and effectively communicate research in a peer setting.

CO 6) Describe the importance of chemical biology research and interdisciplinary work.

SECTION-II: Practical Course

Elective Option-A:

CO1: Electrochemical Methods of Analysis

1. Hydrolysis of NH_4Cl or CH_3COONa or aniline hydrochloride. 2. Determination of λ_0 or λ_α and dissociation constant of acetic acid. 3. Hydrolysis of ethyl acetate by NaOH . 4. Determination of ΔG , ΔH , and ΔS of silver benzoate by conductometry. 5. Determination of critical micellar concentration (CMC) and ΔG of micellization of sodium Lauryl Sulphate / Detergent. 6. Determination of half wave potential $E_{1/2}$ and unknown concentration of Cu or Pb or Zn ion. 7. Amperometric titration of $\text{Pb}(\text{NO}_3)_2$ with $\text{K}_2\text{Cr}_2\text{O}_7$. 8. Stability Constant of a complex ion. 9. Solubility of a sparingly soluble salt. 10. To determine the ionic product of H_2O . 11. Estimation of halide in mixture. 12. Determination of the acid and base dissociation constant of an amino acid and hence the isoelectric point of the acid. 13. Determination of dissociation constants of tribasic acid (phosphoric acid). 14. Construct pH curve for titration of strong base – strong acid, strong base - weak acid and predict the best indicator in these titrations (methyl orange, methyl orange, brocresol green, phenolphthalein, etc.) 15. Analysis of powder XRD of SrTiO_3 and Ag metal or any two compounds (Calculation d, lattice constant, crystal volume and density, and assigning planes to peaks using JCPDS data). 16. Cyclic voltamogram of $\text{K}_3\text{Fe}(\text{CN})_6$ in $\text{KCl}/\text{H}_2\text{O}$ / Ferrocene in TEAP/MeCN . 17. Detailed interpretation of Raman spectra of diatomic molecules.

Elective Option-B:

CO2: Chemical Biology-II Practical

1. Dialysis and Reverse dialysis of protein salt solution. 2. Separation of protein by Gel filtration method. 3. Separation of protein by affinity chromatography method. 4. Separation of protein by Ion exchange chromatography. 5. Native and SDS PAGE of proteins. 6. Separation of amino acids by paper chromatography. 7. Separation of nucleic acid by Agarose gel electrophoresis. 8. Effect of pH on enzyme activity. 9. Effect of Temperature on enzyme activity. 10. Effect of substrate concentration on enzyme activity. 11. Detection of λ_{Max} of proteins. 12. Detection of λ_{Max} of Nucleic acid.

CHP-227: Basic Practical Chemistry – II

At the end of course students will be able to explain

CO 1. Students are trained to different purification techniques in organic chemistry like recrystallization, distillation, steam distillation and extraction.

CO 2. Students are made aware of safety techniques and handling of chemicals. M. Sc. [I]

CO 3. Students are made aware of carrying out different types of reactions and their workup methods.

CO 4. This practical course is designed to make student aware of green chemistry and role of green chemistry in pollution reduction.
radiochemicals.

M.Sc. Part-II Semester-III

CHO-350: Organic Reaction Mechanism and Biogenesis

Section I: Organic Reaction Mechanism

CO1: Methods for determining Reaction Mechanisms

(Students know about Kinetic and non kinetic methods),

CO2: Free Radicals: Generation, stability, reactivity, Free radical substitution, addition to multiple bonds, radicals in synthesis, Inter- and intra-molecular bond formation via mercury hydride, tin hydride, thiol donors, cleavage of C-X, C-Sn, C-S, O-O bonds, Oxidative coupling, C-C bond formation in aromatics, S_NAr reactions, Free Radicals in Organic Synthesis.

CO3: Linear Free Energy Relationships, 4. Hammett plots, Hammett equation, substituent constants, reaction constants, use of Hammett plots, calculation of k and K , Deviations from straight line plots, Taft equation, solvent effects.

Section II: Biogenesis: The building Blocks and Construction Mechanisms,

CO1: Terpenoids: Mono-, Sesqui-, Di-, tri-terpenoids and cholesterol,

CO2: Alkaloids: Derived from ornithine, lysine, nicotinic acid, tyrosine and tryptophan.

CO3: The Shikimate pathway: Cinnamic acids, lignans and lignin, coumarins, flavonoids and stilbens, isoflavanoids and terpenoid quinines

CO4: A case study: Alkaloids isolated from the Roots of *Piper nigrum*

CHO-351: Structure Determination of Organic Compounds by Spectroscopic Methods

Section-I: NMR Spectroscopy

CO1: NMR in Stereochemistry Determination: Homotopic, enantiotopic and diastereotopic protons, Chemical and Magnetic equivalence; First and second order splitting, Complex multiplicity patterns and coupling constants in asymmetric compounds; Simplification of complex spectra, NOE, Diastereomerism, Atrop or axial chirality, % Enantiomeric excess, chiral NMR solvents etc in structure elucidation.

CO2: ¹³C NMR spectroscopy - APT, DEPT and INEPT

CO3: ¹⁵N, ¹⁹F and ³¹P NMR spectroscopy: Fundamentals and applications in structure elucidation of organic compounds, catalysts and biomolecules.

CO4: 2D NMR spectroscopy in structure elucidation: (a) Homonuclear: COSY, TOCSY, 2D

INADEQUATE, 2D- ADEQUATE, NOESY, ROESY (b) Heteronuclear: HSQC, HMQC, HMBC

Section-II: Mass Spectrometry

CO1: Mass Spectrometry: Principle, ionization methods like EI, CI, ES, MALDI and FAB Fragmentation of typical organic compounds, stability of fragments, Rearrangements, factors affecting fragmentation, ion analysis, ion abundance, High-Resolution mass spectrometry in determination of molecular formula.

CO2: Applications of Mass Spectrometry: Determination of the elemental composition, Isotopic Abundance in structure establishment; Analysis of Biomolecules: Proteins and Peptides, Oligonucleotides and Oligosaccharides

CO3: Problems solving: Structure elucidation using UV, IR, 1D (¹H and ¹³C) NMR and 2D NMR (¹H-¹H, ¹³C- ¹H COSY /HETCOR only), APT, DEPT and MS data as well as spectra.

CHO-352: Stereochemistry and Asymmetric Synthesis of Organic Compounds

At the end of course student should be able to -

Section I- Stereochemistry

CO1: Conformations of polysubstituted cyclohexane, six membered rings with SP² carbon, heterocycles with N and O, anomeric effect, stereochemical principles involved in reactions of six membered rings and other than six membered rings, concept of I- Strain.

CO2: A) Stereochemistry of fused and bridged ring systems: Nomenclature, synthesis; stereochemical aspects of Perhydrophenanthrene, Perhydroanthracene, hydrindane, Steroids; Bridged system (bi, tri and polycyclo system) including heteroatoms, Bredt's Rule.

CO3: B) Conformations of following compounds with justification of each: cis and trans - 1,3- and 1,4-di-t-butyl-cyclohexanes; Cis-4-di-t-butylcis-2,5-dihydroxycyclohexane; Twistane; bicyclo- [2.2.2]octane; Trans-anti-transPerhydro-anthracene and the lactone; cyclohexane-1,4-dione; 1,2,2,6,6-penta-methyl-4- hydroxy-4-phenylpiperidine; ψ-tropine; 2-hydroxy-2-phenyl quinolizidine; 4-t-butyl-4- methyl-1,3-dioxane; cis- and trans-2,5-di-t-butyl-1,3-dithianes; cis-2,5-di-t-butyl-1,3,2- dioxaphosphorinan-2-one 3. Determination of configuration, Cram's rule, Cram's cycle model, Cram's dipolar model, Felkin-Anh Model; Resolution and analysis of stereomers - formation of racemization and methods of resolution. Stereochemistry of a polymer chain – Types and examples of Tacticity 4. Decalols, Decalones, Octahydronaphthalenes, decahydroquinolines

Section II- Asymmetric Synthesis: students know about

CO1: Introduction of Asymmetric Synthesis, Chiral pool and Chiral auxiliaries.

CO2: Asymmetric Organocatalysis

CO3: Asymmetric Aldol Reaction, Enantioselective, diastereoselective and double diastereoselective Aldol reactions.

CO4: Transition Metal-Catalyzed Homogeneous Asymmetric Hydrogenation

CO5: Transition Metal-Catalyzed Homogeneous Asymmetric Hydroxylation and Epoxidation

CO6: Asymmetric Phase-Transfer and Ion Pair Catalysis

CHO-353(A): Protection - De-protection, Chiron approach and Carbohydrate

At the end of course student should able to -

Section I: Protection - De-protection, Chiron approach

CO1: Protection and de-protection of functional group in organic synthesis: Hydroxyl group- alkyl ether, benzyl ether, acyl, PMB, Trityl, TMS, TBDMS, THP, MOM, MEM, MIP ether; **Diol** - Acetone, Cyclohexanone; **Amines**- Benzyl, Acyl, CBZ, BOC, FMOC,

CO2: Carboxyl group-Ester, DCCI, DIPCDI; **Ketone and aldehydes**- Glycol, Thioglycol, Ketal,

Acetal; Orthoesters as protecting groups, Protection de-protection approach - In Solid phase synthesis of polypeptide; polynucleotide, cyclitols, and amino-sugars.

CO3: Chiron approach: a) Introduction, b) The concept of chiral templates and chirons wherein the carbon skeleton is the chiral precursor, c) Utilization of the basic concepts in synthesis of (S) Propanediol, (R) and (S) – Epichlorohydrin, L (+)-Alanine, (-) Multistratin, (-) Pentenomycin and (-) Shikimic acid.

Section - II: Carbohydrate Chemistry

CO1: Basics of Carbohydrates: Introduction of sugars, structures of monosaccharides, triose, tetrose, pentose, hexose, D/L forms of aldoses and ketoses in Fisher projections, cyclic hemiacetal forms of monosaccharides, representation of monosaccharide structure (Fisher, Zig-zag, Mills, Haworth projection and Chair conformation), The structure of Glucose, the anomeric configuration, mutarotation (D-Glucose), Conformations of monosaccharides, the anomeric effect. Modified monosaccharides, Alditols, Cyclitols, Nomenclature of monosaccharides, Cyclic forms of the α and β -D-aldoses.

CO2: Synthesis of Glycosides: glycosyldonor acceptor concept, general methods for glycosyl bond formation: Glycosyl halides, Trichloroacetimides, Glycals and Glycal derivatives, Thioglycosides, Phosphites, n-Pentyl glycosides, Sulfoxides, Diazirines, Alkylation of reducing sugars

CO3: - Mannosides, Synthesis of 2-Deoxy Sugars, Orthogonal strategy in Oligosaccharide synthesis, Effect of protecting groups on glycosylation stereoselectivity and coupling efficiency, Intramolecular glycosylation, Total synthesis of natural products: Oligosaccharides and Glycoconjugates.

CHO-353(B): Designing Organic Syntheses and Heterocyclic Chemistry

At the end of course student should able to -

Section I: Designing Organic Syntheses

CO1: Concepts of Retrosynthesis: Retrosynthetic analysis, disconnection approach, Synthons, multiple step synthesis, functional group interconversion, Illogical two group interconversion, C-C disconnection, Donor and acceptor Synthons, two group disconnection, 1,5 related functional group disconnection, Umpolung, convergent synthesis, special methods for small rings, Heteroatom and Heterocyclic compounds, problems,

CO2: Application of Retrosynthetic Approach: Retrosynthesis and synthesis of following Molecules: Strychnine, Reserpine, Thienamycin, Asteltoxin, Indolizomycin, Erythronolide B.

Section II: Advanced Heterocyclic Chemistry

CO1: 1. Systematic nomenclature (Hantzsch-Widman System) for monocyclic, fused and bridged heterocycles. Tautomerism in aromatic heterocycles. Strain-bond angle, torsional strains and their consequences in small ring heterocycles. 2. General chemical behaviour of heterocyclic compounds and their applications in: Biological systems (Anthocyanins, Flavones, Neurotransmitters), Natural Products (Alkaloids: Nicotin, Quinine), Drugs and Medicines (Omeprazole, Amlodipine, Cilostazol)

CO2: Synthesis, reactions and structural effects of heterocyclic rings

a) Common Methods in Ring Synthesis of Aromatic Heterocyclic Systems: Typical ring synthesis involving C – Heteroatom, C – C bond formations, Electrocyclic processes in heterocyclic Synthesis: 1,3 -dipolar cycloadditions producing five - membered heterocycles, Nitrenes in heterocyclic synthesis, Palladium catalysis in the synthesis of Benzo - Fused heterocycles, Fischer synthesis, Epoxidation, Use of Sulphur Ylides, Azides for small rings b) Three and four membered heterocycles: Aziridines, Oxiranes, Thirienes, Azetidines, Oxitanes and Thietanes c) Five-membered and benzo-fused five membered heterocycles: Oxazole, Isoxazole, Thiazole, Pyrazole, Imidazole, Benzothiazole and Benzimidazole d) Six membered and benzo-fused six membered heterocycles: Pyrazine, Pyridazine, Pyrimidine, Quinazoline, Quinoxaline, Aziridines, Quinoline

CHO-354: Practical-I Solvent Free Organic Synthesis

CO1: Solvent Free Carbon–Carbon Bond Formation

1. Pinacol coupling reaction 2. Reformatsky reaction/Luche reaction 3. Knoevenagel condensation 4. Dieckmann condensation 5. Corrole Synthesis 6. Knoevenagel condensation, 3-carboxycoumarin 7. 3-(ethoxycarbonyl)-4-hydroxy-5-(1-hydroxyalkyl)-2-isoxazoline-2-oxide 8. Biginelli reaction 9. Claisen reaction 10. Pechmann reaction 11. calix[4]resorcinarene

CO1: Solvent-Free C–N Bond Formation

1. terephthalic acid dihydrazide 2. azomethine synthesis 3. diazepam synthesis 4. dibenzyl sulfone Synthesis

CO2: Solvent-Free C–S Bond Formation : 1. 1,3-dithiolane synthesis

CO3: Solvent-Free C–X Bond Formation: 1. Cinnamic acid/ stilbene halogenations 2. Phenol bromination using , *N*-bromosuccinimide

CO4: Solvent-Free N–N Bond Formation : 1. Triazenes Synthesis 2. Beckmann rearrangement

CO1: Other Solvent-Free Reactions

1. D-mannitol protection using phenylboronic acid 2. Baeyer-Villiger reaction 3. 2-Hydroxybenzaldehyde oxidation using urea-hydrogen peroxide Complex 4. Alumina-supported permanganate oxidation 5. Sulfide oxidation using MnO₂ 6. Oxidative coupling of thiol using MnO₂ 7. Iodine catalysed S-S bond formation of Cystine

CO5: Solvent free supramolecular assembly formation

1. Caffeine and oxalic acid . 2. *rac*-Bis-beta-naphthol and benzoquinone 3. Isovaleraldehyde and pyrogallol

M.Sc. Part-II Semester-IV

CHO-450: Chemistry of Natural Products

Section I:

CO1: Understanding and planning of total synthesis while maintaining the stereochemistry. A case study: Longifolene – (All Nine syntheses from Advanced Organic Chemistry Carey, Sundberg; Part B).

CO2: Total Synthesis of i. Hirsutellone B ii. Ribisins A and Biii. Subincanadine E :

Section II :

CHO-451: Organometallic Reagents in Organic Synthesis

Students knows about:

CO1: 1. Transition metal complexes in organic synthesis; Pd, Ni, Ru, Fe, Ir and Cu only (C-C, C-N, C-O bond formation reactions with catalytic cycle, ligand and % mole concepts) 2. C=C formation reactions: Wittig, Horner-Wordworth-Emmons, Shapiro, Bamford tevens, McMurry, Julia-Lythgoe and Peterson olefination reactions. 3. multi-component reactions: Ugi, Passerini, Biginelli and Mannich reaction 4. Ring formation reactions: Pausan-Khand, Bergman and Nazarov cyclization 5. Click chemistry: criterion for click reaction, Sharpless azides cycloadditions. Click reactions in synthesis of bioconjugates (sugars and proteins) 6. Metathesis: Schrock and Grubbs catalyst, Olefin cross coupling (OCM), ring closing (RCM) and ring opening (ROM) metathesis, application in polymerization and synthesis of small organic molecules. 7. Use of Boron and Silicon reagents in organic synthesis. 8. Other important reactions: Baylis Hilman, Eschenmoser-Tanabe fragmentation, Mitsunobu reaction

CBOP-4, CHO-452(A): Concepts and Applications of Medicinal Chemistry

Section-I:

CO1: Introduction to Peptides and proteins, Proteins as biological catalyst Nucleic acids, Metabolism, Chemistry of cofactors/coenzymes, Chemistry of TPP, PLP, Folic Acid and other vitamins, Principle of drug design, Chemistry of diseases and Drug development, Proton pump inhibitors and Problem solving.

CO2: Peptides, sequencing and applications in therapeutics, Solution phase and solid phase peptide synthesis and Modern techniques for biomolecules and disease diagnosis.

CO3: Introduction to medicinal Chemistry. History, drug targets, Drug discovery, design and development, Case Study: Design of Oxamniquine

CO4: Pharmacokinetics and Pharmacodynamics of drug: Drug absorption, distribution, metabolism, elimination and toxicity, drug metabolism, biotransformation, Drug receptor interactions, Hansch Equation and significance of terms involved in it.

Section II:

CO1: Structure and activity Relationship: QSAR, Applications of SAR and QSAR in drug design, physio-chemical parameters lipophilicity, partition coefficient, electronic ionization constant, Case Study: Statins

CO2: Introduction, Developments, SAR, Mode of action, limitations and adverse effect of Anti-infective Agents, Beta lactam antibacterial agents (Penicillins, Cephalosporins), Tetracyclins, Macrolides, Chloramphenicol, Polyenes, Amphotrecin-B, Azoles, Amantadine, Acyclovir, Quinine, Quinolines, Quinolones, Refamycine, Sulphonamides

CHO-452(B): Applied Organic Chemistry

Section-I:

CO1: Covalent Organic Frameworks: Structures, Synthesis, and Applications.

CO2: Organic Electroluminescent Materials,

Section –II :

CO1: Supramolecular Organic Compounds

CO2: Single Molecule Switches

CO3: Molecular Machines

CHO-453: Practical-III: Select ANY TWO Section I, II and III

Section-I: Ternary Mixture Separation

The mixture separation should be carried out on micro-scale using ether or water.

The students should be able to:

CO1: Understand and employ concept of type determination and separation

CO2: Meticulously record physical constants

CO3: Perform micro scale chemical elemental analysis

CO4: Perform qualitative estimation of functional groups

CO5: Recrystallize /distill the separated compounds

CO6: Extend these skills to organic synthesis

Section-II: Carbohydrates Synthesis and Isolation Natural Products

Unit I: Students know about Carbohydrate Synthesis

CO1: 1) Synthesis and structural determination of α - and β -D-glucose penta- acetate. 2) Selective deacylation of α - and β -D-glucose penta-acetate. 3) Benzoylation of D-glucose.to D-glucose penta-benzoate. 4) Selective debenzoylation of D-glucose penta-benzoate 5) Synthesis 1,2:5,6-di-O-isopropylene-D-glucofuranose.

CO2: Synthesis of 1,2: 5,6 – di-O-isopropylene-3-O-benzyl –D-glucofuranose. Carbohydrate (sugar molecules) are highly soluble in water, to derivatives the sugar molecules require special practical skill in order to get product in hand.

i) To understand the meaning of dry condition in reaction.

ii) How to prepare dry solvents.

iii) Workup of reaction in minimum quantity of water.

iv) To acquire skill in handling of carbohydrates reaction.

Unit II: Isolation of pigments from the natural products

CO1: 1. Orange Marigold 2. Rose 3. Sunflower 4. Hibiscus 5. Any colored flowers/fruits available in the local area

Unit III: Isolation of essential oils from the natural products

CO1: 1. Ginger 2. Lemongrass 3. Garlic 4. Ajwain/ajowan/Trachyspermum ammi 5. Vekhand (achourus calamus) root 6. natural products available in the local area

Unit IV: Isolation of medicinally important component from the natural products

CO1: 1. Nimbin from Neem leave 2. Amyrin from Apati/Apta bark 3. Eujenol from Tulsi leaves 4. D-Galacturonic Acid from Jeshtamadh 5. Piper from Betel leaf 6. Any medicinally important plants available in the local area.

Section-III:

Project/ Industrial Training/Summer Training/ Internships

Students should carry out a small research project. This should make them familiar with

CO1: Literature survey, research methodologies ii. Data Analysis

CO2: Column and TLC chromatographic techniques

CO3: Characterization of the products by analytical and spectral methods.

CHO-454: Practical-II: Convergent and Divergent Organic Syntheses

Students should acquire **pre-experiment** (Reading MSDS, purification of reactants and reagents, mechanism, stoichiometry etc) and **post-experiment skills** (work-up, isolation and purification of products, physical constants characterization using any spectroscopic methods etc.)

SET-I

CO1: Convergent Synthesis 1 (Three Stage Synthesis)

1. Stage I: Anisole to 4-nitro anisole to 4-amino anisole (2 steps) 2. Stage II: Toluene to 4-nitro toluene to 3-acyl nitro toluene (2 steps) 3. Stage III: Synthesis of N-(1-(2-methyl-5-nitrophenyl) ethyl) aniline from 4-amino anisole, 3-acyl nitro toluene and SBH (One pot synthesis: MCR)

CO2: Divergent Synthesis 1 (5 Single Stage Synthesis from Acetyl acetone):

1. Acetyl acetone to Pyrimidine 2. Acetyl acetone to 2,4-dimethyl-1H-benzo[b][1,4]diazepine 3. Acetyl acetone to Pyrazole 4. Acetyl acetone with 1mmol benzaldehyde to 3-benzylidenepentane-2,4-dione 5. Acetyl acetone with 3 mmol benzaldehyde into 3-benzylidene-6-phenylhex-5-ene-2,4- dione

SET-II

CO1: Convergent Synthesis 2(Three Stage Synthesis)

1. Stage I: 4-Nitro toluene to 4-amino toluene (Reduction by using Sn/HCl) 2. Stage II: Phenol into 2-hydroxy benzaldehyde (Reimer-Tiemann reaction) 3. Stage III: Synthesis of amidoalkyl-2-naphthols from β -Naphthol, 4-amino toluene and of 2-hydroxy benzaldehyde (One pot synthesis: MCR)

CO2: Divergent Synthesis (5 Single Stage Synthesis from β -Naphthol)

1. β -Naphthol to Synthetic dye (By diazonium coupling) 2. β -Naphthol to 6-Bromo-2-naphthol (Bromination reaction) 3. β -Naphthol to β -Naphthyl methyl ether (Methylation reaction) 4. β -Naphthol to temperature dependent sulfonation (Sulfonation reaction) 5. β -Naphthol to (\pm) Binol then Resolution of Binol (Resolution technique)

SET-III

CO1: Convergent Synthesis-3 (Three Stage Synthesis)

1. Stage I: Salicylic acid to 5-Chloro-2-hydroxybenzoic acid 2. Stage II: o- Anisidine to 2-methoxy-4-nitroaniline 3. Stage III: Synthesis of 5-chloro-2-hydroxy-N-(2-methoxy-4-nitrophenyl) benzamide from 5-Chloro-2-hydroxybenzoic acid, -methoxy-4-nitroaniline (One pot synthesis: MCR)

CO2: Divergent Synthesis-3 (5 Single Stage Synthesis from Salysaldehyde)

1. Salicylaldehyde to Salicylaldehyde phenylhydrazone 2. Salicylaldehyde with melanonitrile to 2-iminochromene by intramolecular cyclization. 3. Salicylaldehyde to 2-hydroxy-3,5-dinitrobenzaldehyde 4. Salicylaldehyde to o-Formylphenoxy acetic acid 5. Salicylaldehyde to catechol

SET-IV

CO1: Convergent Synthesis- 4 (Three Stage Synthesis)

1. Stage I: Benzene to acetophenone (F.C acylation) 2. Stage II: 4-Nitrochlorobenzene into 4-amino chlorobenzene (Reduction by using hydrazine) 3. Stage III: Quinoline synthesis by using acetophenone, 4-amino chloro benzene and styrene (One pot synthesis: [3 + 2 + 1] cycloaddition reaction)

CO2: Divergent Synthesis-4 (5 Single Stage Synthesis from Acetophenone)

1. Acetophenone to Ethyl benzene by Wolf Kishner reduction 2. Acetophenone to m-Nitro acetophenone by nitration 3. Acetophenone to Chalcone using aromatic aldehyde 4. Acetophenone into Schiff base using aromatic amine 5. Acetophenone to Benzoic acid and Iodoform 4. Hermann, Terence C. Mor

Rajgad Dnyanpeeths
Anantrao Thopte College, Bhore

Commerce Department
Bachelor of Commerce (B.Com.)

Program Outcomes

PO1	Develop the insights regarding Costing, Banking and Communication skills, Functioning of modern appliance e-format records in modern world.
PO2	Develop the understanding of rules of measurement and reporting to business entities
PO3	Develop the students for designing and implementing cost control, cost reduction in different cost systems in manufacturing process.
PO4	Develop knowledge regarding production operations, management techniques process, business ethics and tool to develop managerial and business skills.
PO5	Develop in depth understanding banking concepts and operations and their implementation.

Program Specific Outcomes

PSO1	Students are understood Various Accounting and Costing Techniques and Methodology.
PSO2	Students are able to understand actual working of industry and their accounting, economical and human resource problems. Students also learn how to resolve it.
PSO3	Students are able to understand how to deliver a quality of product for business success.
PSO4	Students are able to understand new modern technical methods and their applications in accounting, costing and banking sector.
PSO5	Students understand the concept of International Economics, Public Finance, government's revenue and expenditure, debts and budget, economical theories, economic policies and planning.
PSO6	Students are able to understand the Cost accounting tools and information and their uses in Decision making.
PSO7	Students are able to understand of the Tasks, Functions and Skills of Business Administration and latest Developments, theoretical foundation for the preparation and presentation of financial statements in Costing, Accounting, Banking and Finance sector.

Commerce Department
Bachelor of Commerce (B.Com.)

Course Outcomes

Course Outcomes	
Subject Code : 112 (SEM- I) 122 (SEM- II)	FYBCOM – Financial Accounting
CO1	Student acquired knowledge of basic accounting concepts
CO2	To create awareness about application of these concepts in business world
CO3	To impart skills regarding Computerised Accounting ,various software used in accounting
CO4	To impart knowledge regarding finalization of accounts of various establishments
CO5	Students are able to Demonstrate how to create a company, grouping, generation, Accounting Report with the help of Accounting Software Package.
CO6	Students are able to understand valuation of intangible assets
CO7	Students are able to Explain suffered recoupment and lapse of short-working with examples.
CO8	Students are able to Explain allocation of expenses basis of Apportionment in Departmental Accounts.

Course Outcomes	
Subject Code : 114 (SEM- I) 124 (SEM- II)	FYBCOM – Business Mathematics and Statistics
CO1	Students learn basic concepts in Finance and Business Mathematics and Statistics
CO2	Students are able to make applications of Statistics and Mathematics in Business
CO3	Students acquired the knowledge of statistical methods for analysis of data.
CO4	Students are able to analyze the data by using some elementary statistical methods

Course Outcomes	
Subject Code : 115 (SEM- I) 125 (SEM- II)	FYBCOM – Organizational Skill Development
CO1	Define modern office, Office organization, communication and time management.
CO2	Explain records, Classification of files, Different types of forms and digitization of records.
CO3	Discuss role of Public Relation Officer in modern office.
CO4	Demonstrate office automation using computerization through actual visits.
CO5	Discuss modern communication techniques which are used in modern office.
CO6	Identify different types of services provided by office.
CO7	Describe concept of goal setting and identifying SMART goals.

CO8	Study the applicability of new knowledge and skill in modern office and their problems.

Course Outcomes	
Subject Code : 116 - A (SEM- I) 126 - A (SEM- II)	FYBCOM – Marketing & Salesmanship
CO1	Define concept of market and Marketing
CO2	Explain marketing environment and impact of marketing environment on market decision making.
CO3	Discuss buyer behavior and factors affecting on buyer behavior and buying process.
CO4	Describe concept of product, product life cycle, pricing decision their methods and factors affecting pricing decision.
CO5	Understand the logistics management, it's importance in marketing
CO6	Explain the term advertisement, its importance, advantages, types and role of advertisement in sales promotion.
CO7	Discuss concept of rural market, it's nature, differentiate rural and urban market and challenges before rural market.
CO8	Explain the role of modern marketing in globalized era

Course Outcomes	
Subject Code : 116 - B (SEM- I) 126 - B (SEM- II)	FYBCOM – Insurance & Transport
CO1	Define insurance and risk and its nature, scope and types.
CO2	Discuss life insurance, its scope and types and LIC as Career option.
CO3	Discuss general insurance, its scope and types of insurance policies.
CO4	Describe the role of Insurance in Logistics.
CO5	Define transport, its nature, scope, importance and role in Indian economy.
CO6	Discuss different means of transport like Road Transport & Rail Transport in India.
CO7	Classify the different ways of transport like Water Transport, Air Transport, its scope, need and importance.
CO8	Identify Career Options in Travel, Tourism and Hospitality Management.

Course Outcomes	
Subject Code : 116 - E(SEM-I) 126 - E(SEM-II)	F.Y.B.COM. – Business Environment & Entrepreneurship
CO1	Students understood of various aspects business environment useful for would be entrepreneurs
CO2	Students understood of various aspects of pollution and its ill effects
CO3	Students understood of Problems and their causes and remedies
CO4	Students understood the concept of entrepreneur, competencies of a successful entrepreneur
CO5	Students understood the difference between entrepreneurial and

	nonentrepreneurial personalities and thereby getting inspiration to make students personality entrepreneurial
CO6	Students understood the significance of entrepreneurship in economy thereby getting inspiration to become entrepreneur
CO7	Students understood Knowing the functions of related institutions
CO8	Students understood Inspiration from study of Biographies to become entrepreneurs

Course Outcomes	
Subject Code : 231 (SEM- III) & 241 (SEM- IV)	S.Y.B.Com.-Business Communication
CO1	Students understand the concept, process and importance of communication.
CO2	Students develop business communication skills through the application and exercises.
CO3	Students adopt knowledge of various media of communication
CO4	Developing awareness among the students regarding new trends in business communication.
CO5	Students develop their manners & etiquettes and also understand interview techniques, group discussion, grooming manners and oral presentation.
CO6	Students will develop their manners & etiquettes and also understand interview techniques, group discussion, oral presentation regarding various types of letters, resume/bio data/curriculum vitae and job application letter.
CO7	Students are able to understand internal and other correspondence. Also they will be aware regarding new trends in business communication.
CO8	Students understand the recent trends in business communication.
CO9	Students are able to understand formal mails and blog writing

Course Outcomes	
Subject Code : 234(SEM- III) 244(SEM- IV)	S.Y.B.COM.- Business Management
CO1	Students are able to get basic knowledge and understanding about various concepts of Business Management.
CO2	Students getting knowledge of various functions of management
CO3	Students are able to get knowledge about tools and techniques to be used in the performance of the managerial job.
CO4	Students adopt knowledge regarding motivation of staff, Leadership skill which is helpful in successful business environment.
CO5	Students learn overview of management-evolution of management, management thinkers, Managerial Skills etc
CO6	Students learn planning & decision making- Importance & types of Planning, Types of Decisions & Steps in Decision Making
CO7	Students learn organization & staffing-Organization Structure, Importance of Staffing, Methods of Recruitment
CO8	Students learn direction & communication- Techniques & importance of Direction, Communication Process & importance of effective Communication.

Course Outcomes	
Subject Code : 232E(SEM-III) 242E (SEM-IV)	S.Y.B.COM.- Corporate Accounting
CO1	Students get knowledge about various Concepts , Objectives and applicability of some important accounting standards
CO2	Students understanding the difference between commencement and incorporation of a company and the accounting treatment.
CO3	students acquired knowledge for preparation of final accounts of a company as per Schedule III of the Companies Act 2013
CO4	Students understanding the difference between commencement and incorporation of a company and the accounting treatment
CO5	students learn recent trends in the field of accountancy
CO6	students update the knowledge of the process of liquidation of a company
CO7	Students develop the knowledge about consolidation of financial statement with the process of holding.
CO8	Student acquired knowledge of corporate policies of investment for expansion and growth through purchase of stake in or absorption of smaller units.

Course Outcomes	
Subject Code : 235 (SEM-III) 245 (SEM-IV)	S.Y.B.COM.- Elements of Company Law
CO1	Students understood Background and Salient Features of the Act of 2013, Overview of the changes introduced by the Act of 2013;
CO2	Students come to know various stages in the Formation and Incorporation, Commencement of business.
CO3	Students come to know Memorandum of Association, Alteration of memorandum. , Articles of Association:
CO4	Students realized Various Modes for Raising of Share Capital including private placement, public issue, rights issue, bonus shares
CO5	Students realized Forfeiture and Surrender of Shares: Meaning of forfeiture of shares: - Conditions/Rules of valid forfeiture- Effect of forfeiture- Re-issue of forfeited shares, Nomination of shares
CO6	Students realized E-, E-filing , DIN-Directors Identification Number
CO7	Students come to know Powers, Restrictions, and Prohibition on Board. (Ss. 179 to 183) 7.2 Director: Meaning and Legal position of directors.
CO8	Students come to know Appointments of Managing Director, Role of Board of Directors. ,Prevention of Oppression and Mismanagement (Ss. 241 to 246)
CO9	Students come to know Board Meeting, Formalities of valid meeting.
CO10	Students come to know Compromises, Arrangements and Amalgamation:

Course Outcomes	
Subject Code : 236E(SEM-III) 246E (SEM-IV)	S.Y.B.COM.- Cost and Works Accounting I
CO1	Students are able to define concept of costing,
CO2	Students are able to classify different element of cost, concept of material control,

	calculate stock levels, preparation of Cost Sheet
CO3	Students understanding the basic concepts of cost.
CO4	Students are to understand, develop and apply the techniques of inventory control.
CO5	Students are able to Identify store location and layout and apply pricing methods of issue of material, Purchase Procedure
CO6	Students are able to Explain and illustrate inventory control techniques.
CO7	Students are able to distinguish different methods of remuneration and incentive plans

Course Outcomes	
Subject Code : 236G (SEM-III) 246G (SEM-IV)	S.Y.B.COM.- Business Entrepreneurship-I
CO1	Define the term Entrepreneurs, Entrepreneurship, Unemployment. Explain the problems of unemployment. Describe wealth creation, Entrepreneurial motive and Competencies.
CO2	Explain the role of Vikhe Patil, Karmavir Bhaurao Patil, Bhausaheb Thorat, Ratnnappa Kumbhar and Dhanjayrao Gadgil in Co-operative Movement and Sector in Maharashtra.
CO3	Discuss the term Creativity and process of Creativity. Identify the tools of creativity. Explain Innovation and sources of innovation.
CO4	Define Business Ethics, CSR, Business Goals. Explain Social Responsibilities of business, Discuss the term Social Audit and Corporate Governance.
CO5	Explain Group Entrepreneurship, illustrate individual and Group Entrepreneurship, discuss SHG and its administrative functions.
CO6	Describe Entrepreneurial Opportunities in Service Sector, illustrate opportunities in Rural and Urban service industries.
CO7	Define Franchising, explain the types and advantages of franchisee. Explain the steps for starting Franchisee. Discuss the term Business Process Outsourcing.
CO8	Explain the challenges in Entrepreneurship Development. Discuss Social, Cultural, Educational, Political and Globalization challenges.

Course Outcomes	
Subject Code : 236 H(SEM-III) 246H (SEM-IV)	S.Y.B.COM.- Marketing Management-I
CO1	Pupil known concept of Marketing Management which is the basic foundation of Marketing subject.
CO2	Students get the basic knowledge of Marketing Management to be a successful modern marketer.
CO3	Students inculcate knowledge of various aspects of marketing management through

	practical approach.
CO4	Students interpret the issues in marketing and their solutions by using relevant theories of marketing
CO5	Students get knowledge about recent trends in marketing management.
CO6	Students understand the concept of Green Marketing.
CO7	Students are enable to apply this knowledge in practical by enhancing their skills in the field of Marketing.

Course Outcomes	
Subject Code : 351 H(SEM-V) 361 (SEM-VI)	T.Y.B.COM.- Business Regulatory Framework (M.Law)
CO1	Students understanding the concept of contract, terms & various provisions of Indian Contract Act 1872, Indian Partnership Act 1932, LLP Act 2008.
CO2	Students are understanding the terms & rules relating to Sale of Goods Act, 1930. And get information regarding E-commerce, digital signature & laws relating to legality to E-transactions and their legal value.
CO3	Students will understand procedure to file complaint, jurisdiction, powers & functions of consumer dispute redressal agencies under Consumer Protection Act 1985. They get information about WIPO, TRIPs & categories of IPR covered by TRIPs Agreement.
CO4	Students will be able to understand negotiable instruments i.e. Promissory Note, Bill of Exchange & Cheque. Also will informed laws relating to Negotiable Instruments Act 1882.
CO5	Students get knowledge regarding arbitration agreement, rights & duties of arbitrator, conciliation proceeding.

Course Outcomes	
Subject Code : 354 H(SEM-V) 364 (SEM-VI)	T.Y.B.COM.- Auditing and Taxation
CO1	Students are able to explain various type of audit & verification and valuation of assets and liabilities
CO2	Students are able to Recognize Company Auditors, tax audit with computerized system
CO3	Students are able to define concept under Income Tax act 1961, Calculate Taxable Income under Head of Income
CO4	Students are able to Calculate total taxable Income and tax liability of an individual
CO5	Students are able to Execute procedure of Income Tax Return Filing.

Course Outcomes	
Subject Code : 352 H(SEM-V) 362 (SEM-VI)	T.Y.B.COM. – Advanced Accounting
CO1	Brief Review of Indian Accounting Standard: - AS- 3, AS-7, AS-12, and AS15 AS-17 to AS-25 simple practical examples of application nature.
CO2	Students prepared of Final Accounts in vertical form as per Banking Regulation Act 1949-

CO3	Students come to know. Claim for Loss of Stock , Indemnity under policy - Some important terms - Procedure for ascertaining claims, Claim for Loss of Fixed Assets .
CO4	Students realized a. Credit Co-operative Societies :- b. Consumer Co-operative Societies
CO5	Students prepared VAT & VAT Report B. Service Tax, Central Value Added Tax, and Income with the help of Accounting Software.
CO6	Stock and Debtors System: - Introduction - Types of Branches - Goods supplied at Cost & Invoice Price.
CO7	Students made conversion of Single Entry into Double Entry.
CO8	Students solved the problems on Ratio Analysis restricted to the following Ratio only - *Gross Profit Ratio *Net Profit Ratio * Operating Ratio * Stock Turnover Ratio * Debtor Turnover Ratio * Current Ratio * Liquid Ratio * Debt to Equity Ratio.

Course Outcomes	
Subject Code : 355E H(SEM-V) 365E (SEM-VI)	T.Y.B.COM.- Cost and Works Accounting Paper II
CO1	Students are able to classify types of overheads & accounting of overheads and apply apportionment and reapportionment of overheads.
CO2	Students are able to explain methods of overhead absorption.
CO3	Students are able to Recognize purpose and benefits of activity based costing & discuss various methods of costing.
CO4	Students are able to Analyze and evaluate procedure of contract costing.
CO5	Students are able to Apply service costing methods in real life.

Course Outcomes	
Subject Code : 356E H(SEM-V) 366E (SEM-VI)	T.Y.B.COM. – Cost & Work Accounting III
CO1	Students realized Fixed cost, Variable costs, Contribution, Profit-volume Ratio, Break-Even Point & Margin of Safety.
CO2	Students realized the various Types of Budgets.
CO3	Students realized Advantages and disadvantages. Uniform costing and Inter-firm Comparison
CO4	Students realized management information system in Costing
CO5	Students realized Problems on Material & Labour variances.
CO6	Students realised Advantages & Limitations of Farm Costing 6.3 Practical Problems
CO7	Students come to know Cost records and Verification of Cost Records 7.3 Cost auditor – Appointment- Rights and duties
CO8	Students prepared the cost Audit Report.

Course Outcomes	
Subject Code : 355GH(SEM-V) 365G (SEM-VI)	T.Y.B.COM. – Business Entrepreneurship-II
CO1	Define the terms SSI, Product Range, Tiny Industries, Ancillary Industries, Cottage Industries. Explain the role of SSI in Indian Economy.

CO2	Explain Business Opportunities, identifies the alternatives of opportunities, describe the steps in formation and registration procedure of SSI.
CO3	Describe the various Organization forms, define BEP, Ratio analysis, gross and net profit ratio. Explain the term Project Audit.
CO4	Define SFCs, SIDBI, IFCI, DIC, KVIC. Explain the Role and functions of these in financial assistance. Discuss Tax Concession and Incentives for SSI.
CO5	Explain the term Business Plan. Discuss Financial, Marketing, Human resource, Technical and Social aspect of Business Plan.
CO6	Describe Small Enterprise Management with various approaches. Explain Start Up Phase Management, Stability Phase, Growth Phase Management.
CO7	Define Business Crises, Sickness. Explain various types of crises and causes of crises and Sickness.
CO8	Explain Project Report, Format of Business Plan, Report survey of SSI, Describe Tax concession and Financial assistance available to SSI. State documents required for registration of SSI

Course Outcomes	
Subject Code : 356G H(SEM-V) 366G (SEM-VI)	T.Y.B.COM. – Business Entrepreneurship-III
CO1	Understand the Meaning, Definitions, Goals, Approaches of Organizational Behavior and Historical roots of Organizational Behavior and Organizational Behavior Models.
CO2	Explain the Determinants of individual behavior and Personality Traits, Personality Development, Emotional Intelligence, Entrepreneurial Personality.
CO3	Study of autobiographies of Entrepreneurs like Dr. Nilakantha Kalyani, Shri. D.S. Kulkarni, Mr. Aditya Vikram Birla, Shri. Dilip Narayan Borawake, Mrs. Jyoti Naik (Ejjat Ki Lajjat, Shri Mahila Gruh Udyog, Lijjat Papad), and Shri Ramesh J. Chavan-Thundered Unbottled.
CO4	Describe Group and Group Dynamics like Group task, Group size, Group formation process, Group Structure, Group Dynamics, Group Cohesion.
CO5	Define Team Building, Types of team, creating high performance team and Managing team.
CO6	Describe stress, stress management and Conflict Management and Remedies to overcome the Conflicts.
CO7	Use of motivation theories, Job description & Job analysis, Management by Objects (MBO)– Job rotation – Job enrichment – Employee Involvement Programme.
CO8	Connect acquired knowledge & skill of organizational change and development.

Course Outcomes	
Subject Code : 355H(SEM-V) 365H (SEM-VI)	T.Y.B.COM. – Marketing Management-II
CO1	Students get knowledge about agricultural marketing, various marketing regulations, importance of global marketing and various measures used by cyber security marketers in today's digital world.
CO2	Students understanding the conceptual framework of marketing and its applications in decision making under various environmental constraints.

CO3	Students understanding the concept of effective marketing decisions, including assessing marketing opportunities and developing marketing strategies and implementation plans.
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Course Outcomes	
Subject Code : 356 H(SEM-V) 366H (SEM-VI)	T.Y.B.COM. – Marketing Management-III
CO1	Students get the knowledge about the concept of advertising and advertising media, appeals and approaches in advertisement
CO2	Students acquire the concept of economic, social and regulatory aspects of advertising, role of Brand Management in marketing.
CO3	Students enable to apply this knowledge in precisely enhancing their skills in the field of advertising.
CO4	Students get the knowledge about the concept of Marketing of Service, Creative Advertisements, and social media marketing. Technique and process of Marketing Control and Audit.
CO5	Students are able to apply knowledge in practicality by enhancing their skills in the field of advertising.

Anantrao Thopte College , Bhore Dist. Pune

Department of Computer Science

B.Sc. (Computer Science)

Programme Outcome

- Develop ability to analyze a problem, identify and define the computing requirements, which may be appropriate to its solution.
- To prepare students to undertake careers involving problem solving using computer science and technologies.
- Develop ability to pursue advanced studies and research in computer science.
- To produce entrepreneurs who can innovate and develop software product.

F.Y.B.Sc. (Computer Science) Semester-I

Course Title:-CS-101 Problem solving using computer and C programming

Course Outcomes:-

- Explore algorithmic approaches to problem solving.
- Ability to analyze a problem and devise an algorithm to solve it.
- Able to formulate algorithms, pseudo codes and flowcharts for arithmetic and logical problems.
- Ability to implement algorithms in the 'C' language.
- Develop modular programs using control structures and arrays in 'C'.

Course Title :CS-102 Database Management Systems

Course Outcomes

- Understand fundamental concepts of database.
- Understand user requirements and frame it in data model.
- Ability in creations, manipulation and querying of data in databases.
- Ability to solve real world problems using appropriate set, function, and relational models.
- Ability to design E-R Model for given requirements and convert the same into database tables.

Course Title:- CS-103 Practical Course based on CS-101 and CS-102 (C and DBMS)

Course Outcome:-

- Able to devise pseudo code and flowchart for computational problems.
- Understand how to write, debug and execute simple programs in C.
- Able to create database tables in Postgres SQL.
- Able to write and execute simple and nested queries.

Course Title: - ELC-111: Semiconductor Devices and Basic Electronic Systems

Course Outcome:

- To study various types of semiconductor devices, elementary electronic circuits and systems.
- To bridge the gap between Theoretical and practical knowledge.

Course Title: - ELC-112: Principles of Digital Electronics

Course Outcome:

- To get familiar with concepts of digital electronics.
- To study arithmetic circuits, combinational circuits and sequential circuits.

Course Title: - ELC-113 Electronics Practical Paper – I

Course Outcome:

- To use basic concepts for building various applications in electronics.
- To understand design procedures of different electronic circuits as per requirement.
- To build experimental setup and test the circuits.
- To develop skills of analyzing test results of given experiments.

Course Title: MTC 111 Matrix Algebra

Course Outcome:

- Perform basic Matrix operation.
- Define special matrices: diagonal, triangular, and symmetric.
- Basics of solving systems of linear equations.
- Understand determinants and their properties.
- Logic behind writing programs using computer language.
- Factorization of any square matrix in simpler LU-form.

Course Title: MTC 112 Discrete Mathematics

Course Outcome:

- Understanding the concepts of discrete mathematics.
- Learning applications of discrete structures in Computer Science.
- Express a logic sentence in terms of predicates, quantifiers, and logical connectives.
- Apply the operations of sets and use Venn diagrams to solve applied problems; solve problems using the principle of inclusion-exclusion.
- Demonstrate different traversal methods for trees and graphs.
- Model problems in Computer Science using graphs and trees.

Course Title: MTC 113 Mathematics Practical

Course Outcome:

- Students will be able to compute matrix calculation using Maxima software.
- Use appropriate modern technology to explore calculus concepts.
- Solve applied problems using matrices.
- Solve systems of linear equations by use of the matrix.
- Students will be able to formulate problems in the language of sets and perform set operations, and will be able apply the Fundamental Principle of Counting, Multiplication Principle.

Course Title: CSST 111 Descriptive statistics

Course Outcome:

- The main purpose of descriptive statistics is to provide a brief summary of the samples and the measures done on a particular study.
- To provide basic information about variables in a dataset.

Course Title: CSST 112 Mathematical Statistics

Course Outcome:

- It will help students develop skills in thinking and analyzing problems from a probabilistic and statistical point of view.
- It will provide difference between Discrete and continuous distributions.

Course Title:- CSST 113 Statistics Practical Paper I

Course Outcome:

- To Study free statistical software's and use them for data analysis in project
- To use of Statistical tools in Ms-Excel

F.Y.B.Sc(Computer Science) Semester -II

Course Title:-CS 201 Advanced C programming

Course Outcomes:-

- Develop advanced concepts of programming using C.
- Develop modular programs using control structures, pointers, arrays, strings and structures.
- Design and develop solutions to real world problems using C.
- Able to develop structured programming approach.

Course Title : CS-202 Relational database Management Systems

Course Outcome

- Able to acquire knowledge of data security and its importance.
- Design E-R Model for given requirements and convert the same into database tables.
- Able to use database techniques such as SQL & PL/SQL.
- Understand and able to implement concept of transactions.
- Use advanced database Programming concepts.

Course Title:- CS-203 Practical Course based on CS-201 and CS-202(Advanced C and RDBMS)

Course Outcome:-

- Write debug and execute programs using advanced features in C.
- To perform advanced database operations.

Course Title: - ELC-121 Instrumentation System

Course Outcome:

- To study various kind of Instrument of different Instrumentation System
- To control the parameter in process or a particular system.
- To study smart sensors for smart Electronics Applications.

Course Title: - ELC-122 Basics of Computer Organization

Course Outcome:

- To study and design different counters.
- To study basics of computer system.
- To study Memory Organization.

Course Title: - ELC- 123 Electronics Practical Paper – II

Course Outcome:

- To use basic concepts for building various applications in electronics.
- To understand design procedures of different electronic circuits as per requirement.
- To build experimental setup and test the circuits.
- To develop skills of analyzing test results of given experiments.

Course Title:- MTC 121 Linear Algebra

Course Outcome:

- Solve systems of linear equations using various methods including Gaussian and Gauss Jordan elimination and inverse matrices.
- Perform matrix algebra, invertibility, and the transpose and understand vector algebra in \mathbb{R}^n .
- Compute linear transformations, kernel and range, and inverse linear transformations, and find matrices of general linear transformations.
- Compute inner products on a real vector space and compute angle and orthogonality in inner product spaces.
- Prove basic results in linear algebra using appropriate proof-writing techniques such as linear independence of vectors; properties of subspaces; linearity, injectivity and surjectivity of functions; and properties of eigenvectors and eigenvalues.

Course Title:- MTC 122 Graph Theory

Course Outcome:

- Explain basic concepts in graph theory.
- Define how graphs serve as models for many standard problems.
- Account for the theory of paths and degree of connectedness of graph.
- Learn the use of spanning tree.
- Discuss the concept of graph, tree, and Euler graph.
- See the applications of graphs in science, business and industry.
- To present a survey of essential topics for computer science students who will encounter some of them again in more advanced courses.

Course Title:- MTC 123 Mathematics Practical

Course Outcome:

- Students will be able to find eigen values and eigen vectors using Maxima software.
- Students will be able to perform operations on orthogonality and quadratic forms.
- Use appropriate modern technology to explore calculus concepts.

Course Title:- CSST 121 Method of Applied Statistics

Course Outcome:

- To create a mathematical model that can be used to predict the values
- To Handle large data and analyze it by statistical tools

Course Title:- CSST 122 Continuous Probability Distribution and Testing of Hypothesis

Course Outcome:

- To study distribution of various data
- Student should use these techniques for their project.

Course Title:- CSST 123 Statistics Practical Paper II

Course Outcome:

- How to use statistical tools in real life situation.
- Handling data for research purpose

S. Y. B. Sc. (Computer Science) Semester- I

Course Title:-CS-211 Data Structure

Course Outcome

- Understand different methods of organizing large amount of data using data structure.
- Able to choose appropriate data structure as applied to specified problem definition.
- Understand various techniques for representation of the data in the real world.
- Able to compute the complexity of various algorithms.
- Able to understand internal structure of compiler and interpreters.

Course Title:- CS-212 RDBMS

Course Outcome

- Able to understand database concepts and database management system software.
- Analyze and design a real database application.
- Develop and evaluate a real database application using a database management system.
- Able to develop applications using PL/SQL & front end tools.

Course Title: - ELC-211: Digital System Hardware

Course Outcome:

- To study and understand basics of microprocessors.
- To understand fundamentals of multicore technology.

Course Title: - ELC-212: Analog Systems

Course Outcome:

- To understand basics of analog electronics.
- To study different types of sensors.
- To understand different types of signal conditioning circuits.
- To learn data conversion techniques.
- To apply knowledge of analog systems in different applications.

Course Title:-MTC-211 Linear Algebra**Course Outcome:**

- Analyze finite and infinite dimensional vector spaces and subspaces over a field and their properties, including the basis structure of vector spaces,
- Use the definition and properties of linear transformations and matrices of linear transformations and change of basis, including kernel, range and isomorphism,
- Compute with the characteristic polynomial, eigenvectors, eigen values and Eigen spaces, as well as the geometric and the algebraic multiplicities of an eigen value and apply the basic Diagonalization result.

Course Title:-MTC-212 Numerical Techniques**Course Outcome:**

- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Analyze and evaluate the accuracy of common numerical methods.

Course Title:- EN-211:Technical English Sem - I**Course Outcome:**

- To expose students to the best examples of prose and poetry in English so that they realize the beauty and communicative power of English.
- To enhance employability of the students by developing their linguistic competence and communicative skills.

S. Y. B.Sc.(Computer Science) Semester-II

Course Title:- CS-221 Object Oriented Programming using C++ Course Outcome

- Able to understand the concept of object oriented programming.
- Use the benefits of object oriented design and understand when it is an appropriate methodology to use.
- Design object oriented solutions for small systems involving multiple objects.

Course Title:-CS-222 Software Engineering Course Outcome

- Able to design and conduct experiments, as well as to analyze and interpret data.
- Able to identify, formulate, and solve engineering problems.
- Able to analyze, design, verify, validate, implement, apply, and maintain software systems.
- Able to understand different phases of SDLC.

Course Title:-CS-223 Practical Based on CS-211 and CS221-Sem-I and II Course Outcome

- Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
- Students will be able to use linear and non-linear data structures like stacks, queues, linked list etc.
- Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.
- Students will be able to perform programming in object-oriented language.
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.

Course Title:-CS-224 Practical Based on CS-212 and CS222-Sem-I and II Course Outcome

- To use SQL- the standard language of relational databases.
- Able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
- Able to identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based.
- Students will be able to create report/documentation for real life projects.
- Can apply their knowledge and understanding with a professional approach.

Course Title: - ELC-221: The 8051 Architecture, Interfacing &

Programming Course Outcome:

- To study the basics of 8051 microcontroller, Programming and its Interfacing techniques.
- To apply knowledge of 8051 to design different application circuits.
- To introduce the basic concepts of advanced Microcontrollers.

Course Title: - ELC-222: Communication**Principles Course Outcome:**

- To understand basics of communication systems.
- To understand digital communication techniques.
- To introduce concepts in advanced wireless communication.

Course Title: - ELC-203: Practical**Course Outcome:**

- To use basic concepts for building various applications in electronics.
- To understand design procedures of different electronic circuits as per requirement.
- To build experimental setup and test the circuits.
- To develop skills of analyzing test results of given experiments.

Course Title:-MTC-221 Computational Geometry**Course Outcome:**

- Student will get acquainted with the typical problems of computational geometry.
- Student will understand the existing solutions and their applications in computer graphics and machine vision.
- Student will get deeper knowledge of mathematics.
- Student will learn the principles of geometric algebra including its application in graphics and vision related tasks.
- Student will practice programming, problem solving and defense of a small project.

Course Title:-MTC-222 Operation Research:**Course Outcome**

- Construct linear integer programming models and discuss the solution techniques.
- Set up decision models and use some solution methods for nonlinear optimization problems.
- Propose the best strategy using decision making methods under uncertainty and game theory.
- Solve multi-level decision problems using dynamic programming method.
- Formulate pure, mixed, and binary integer programming models.
- Formulate the nonlinear programming models.

Course Title:-MTC-223 Mathematics Practical**Course Outcome**

- Do basic 2- and 3-D plotting,

- Write code in the prescribed language for a number of algorithms for the topics covered given pseudo-code, or modify a given code to perform an indicated task,
- Debug code in the prescribed language at an appropriate level, and decide if they can make their code more efficient,
- Verify the correctness of a solution or decide whether the result is an acceptable approximation to the solution,
- Identify algorithms with which to solve mathematical problems, and
- Write programs from the underlying algorithms, and demonstrate the ability to employ good commenting and coding techniques.

Course Title:- EN-221: Technical English – Sem-II

Course Outcome:

- To expose students to the best examples of prose and poetry in English so that they realize the beauty and communicative power of English.
- To enhance employability of the students by developing their linguistic competence and communicative skills.

T.Y. B.Sc. (Computer Science)

Semester I Course Title:- CS-331 Systems Programming

Course Outcome :

- Able to design structure of a simple editor.
- Able to design structure of Assembler and macro processor for an hypothetical simulated computer.
- Understand working of linkers and loaders and other development utilities.
- Understands Complexity of Operating system as a software.

Course Title : CS-332 Theoretical Computer

Science Course Outcome :

- Understand the fundamental mathematical , regular languages and finite automata
- Able to describe and transform regular expressions and grammars.
- Able to design different types of Finite Automata and Machine as Acceptor , verifier and translators.
- Able to understand the concept and design of push-down automata.
- Able to understand the design and different types of Turing machine .
- Understand the relation between context free languages, PDA and TM .
- Able to understand recursive enumerable languages, recursive function theory and Problems on recursive function.

Course Title : CS-333 Computer

Networks –I Course Outcome :

- Understand basic computer network technology.
- Understand and explain Data Communications System and its components.
- Able to identify the different types of network topologies and protocols.
- Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.

- Identify the different types of network devices and their functions within a network .
- Understand the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Course Title : CS-334 Internet

Programming I Course Outcome :

- To understand client server architecture.
- Implement PHP, Server Side Scripting Language .
- To know how to implement socket programming.

Course Title : CS-335 Programming in

Java-I Course Outcome :

- Understand to implement object oriented programming concepts.
- Understand how to design graphical user interface in Java programs.
- Understand how to design and develop applets.
- Able to design User Interface using Swing and AWT.
- Understand concept of packages and study how to implement them.

Course Title : CS-336 Object Oriented Software

Engineering Course Outcome :

- Understand the importance of Object Orientation in Software engineering.
- Acquire knowledge of components of Unified Modeling Language .
- Able to understand techniques and diagrams related to structural modeling .
- Will learn techniques and diagrams related to behavioral modeling .
- Will learn different techniques of Object Oriented analysis, design and testing .

T.Y. B.Sc. (Computer Science)

Semester II Course Title:- CS--341 Operating Systems

Course Outcomes:

- Understand the role of operating system as System software.
- Able to compare the various algorithms and comment about performance of various algorithms used for management of memory, CPU scheduling, File handling and I/O operations.
- Understand various concept related with Deadlock to solve problems related with Resources allocation, after checking system in Safe state or not.
- To understand role of Process synchronization towards increasing throughput of system.

Course Title:- CS-342 Compiler

Construction Course Outcomes:

- Learn how to use lexical analyzer and parser generator tools.
- Understand how to build symbol tables and generate intermediate code.
- Will study compiler architecture.

- Study and understand the technique of compiler optimization.

Course Title:- CS-343 Computer Networks II
Course Outcomes:

- Will study how to configure PCs running Linux so that they receive IP addresses, have default routes, can resolve host names, and so on. (And similarly for Windows, if time permits.).
- Able to apply knowledge of the TCP/IP layering model to intelligently debug networking problems.
- Will be able to use Linux commands to understand how a PC is configured.
- Will be able to understand and build the skills of subnetting and routing mechanisms.

Course Title : CS-344 Internet Programming
Course Outcomes :

- Understand working of XML, CSS and XML parsers.
- Will learn to implement PHP framework for effective design of web application.
- Will use JavaScript to program the behavior of web pages.
- Will use AJAX to make our application more dynamic.

Course Title : CS-345 Programming in Java-II
Course Outcome :

- Understand how to use database programming using Java.
- Will be able to implement web development concept using Servlet and JSP.
- Will be able to develop a game application using multithreading.
- Learn and implement socket programming concept.

Course Title:- CS-346 Computer Graphics
Course Outcomes:

- Understand how to use graphics objects represented in computer.
- Will be able to correlate between user and computer through graphics.
- Able to increase the productivity through graphics.
- Understand programmer's perspective of working of computer graphics.

Course Title:- CS-347 Practical Based on CS-331 and CS341-Sem-I and II
Course Outcomes:

- Understand how to implement structure of a simple editor.
- Able to develop structure of Assembler and macro processor for an hypothetical simulated computer.
- Able to develop various algorithms used for management of memory, CPU scheduling, File handling and I/O operations.
- Understand how to develop Banker algorithms related with Resources allocation, after checking system in Safe state or not.

**Course Title:- CS-348 Practical Based on CS-335 and CS345-Sem-I and II and
ComputerGraphics using Java**

Course Outcomes:

- Understand how to implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic buildingactivity.
- Able to identify classes, objects, members of a class and the relationships among themneeded for a finding the solution to specific problem.
- Able to demonstrates how to achieve reusability using inheritance, interfaces andpackages and describes faster application development can be achieved.
- Able to demonstrate understanding and use of different exception handling mechanismsand concept of multithreading for robust faster and efficient application development.
- Able to identify and describe common abstract user interface components to design GUIin Java using Applet & AWT along with response to events .
- Able to identify, Design & develop complex Graphical user interfaces using principalJava Swing classes based on MVC architecture.

**Course Title:- CS-349 Practical Based on CS-334 and CS344-Sem-I and II and
ProjectCourse Outcomes:**

- Able to design a basic web site using HTML5 and CSS3 to demonstrate responsive webdesign.
- Learn how to implement dynamic web pages with validation using JavaScript objects byapplying different event handling mechanism.
- Learn how to use AJAX Programming Technique to develop RIA.
- Able to develop simple web application using server side PHP programming andDatabase Connectivity using My SQL.
- Will understand how to build well-formed XML Document and implement Web Serviceusing Java.

Program Outcome

- Provides technology-oriented students with the knowledge and ability to develop creative solutions.
- Develop skills to learn new technology.
- Apply computer science theory and software development concepts to construct computing-based solutions.
- Design and develop computer programs/computer-based systems in the areas related to algorithms, networking, web design, cloud computing, Artificial Intelligence, Mobile applications.

M.Sc. (Computer Science) Sem – I

Course Title:-CSUT111: Paradigm of Programming Language

Course Outcomes:-

- To Understand the basic language implementation techniques
- Develop ability to learn new languages more quickly
- To understand the concept of functional programming language
- Develop ability to learn and write small programs in different programming Languages

Course Title:-CSUT112: Design and Analysis of Algorithm

Course Outcomes:-

- To design efficient algorithms using various algorithm designing strategies
- To analyze the problem and develop the algorithms related to these problems
- To classify the problem and apply the appropriate design strategy to develop algorithm
- To design algorithm in context of space and time complexity and apply asymptotic notation

Course Title:-CSUT113: Database Technologies

Course Outcomes:-

- To study types of NoSQL databases (Document oriented, keyValue pairs, Column-oriented and Graph)
- To understand detailed architecture, define objects, load data, query data and performance tune NoSQL databases.
- Able to handle large volumes of structured, semi-structured, and unstructured data using database technologies.

Course Title:-CSDT114: Cloud computing (Choice Based Optional Paper)

Course Outcomes:-

- To understand the principles and paradigm of Cloud Computing
- Ability to design and deploy Cloud Infrastructure
- Understand cloud security issues and solutions

- Ability to understand role of Virtualization Technologies
- Design & develop backup strategies for cloud data based on features

Course Title:-CSDT114: Artificial Intelligence (Choice Based Optional Paper)Course

Outcomes:-

- To analyze and formalize the problem as a state space, graph, design heuristics
- Ability to represent solutions for various real-life problem domains using logic-based techniques
- Understand the numerous applications and huge possibilities in the field of AI
- Ability to express the ideas in AI research and programming language related to emerging technology.

Course Title:-CSDT114: Web Services (Choice Based Optional Paper)Course

Outcomes:-

- To understand the details of web services technologies like WSDL, UDDI, SOAP
- Ability to learn how to implement and deploy web service client and server
- Learn how to explore interoperability between different frameworks
- Understand architectural elements of a RESTful system

Course Title:-CSUP115: PPL and Database Technologies Practical

Course Outcomes:-

- Apply the knowledge of Scala to develop web-based applications
- Provides knowledge of code optimization
- To understand concept of interoperability.
- Students are able to build and maintain the databases handling in real life applications and daily needs.
- Able to perform hands-on NoSql database lab assignments that will allow students to use the four NoSQL database types via products such as Cassandra, MongoDB, Neo4J and Riak

M.Sc. (Computer Science) Sem – II

Course Title:-CSUT121: Advanced Operating System

Course Outcomes:-

- To design and understand the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory and Paging systems.
- To evaluate, and compare OS components through instrumentation for performance analysis.
- To analyze the various device and resource management techniques for timesharing and distributed systems
- To develop and analyze simple concurrent programs using transactional memory and message passing, and to understand the trade-offs and implementation decisions.

Course Title:-CSUT122: Mobile Technologies

Course Outcomes:-

- To gain knowledge of installing Android Studio and Cross Platform Integrated Development Environment.
- An ability to use the techniques, skills, and modern technology.
- To develop the different applications that mobile computing offers to people, employees, and businesses

- To develop high levels of technical competence in the field of mobile technology.

Course Title:-CSUT123: Software Project Management Course

Outcomes:-

- To identify the impact of IT projects on the performance of the organizations
- To understand, manage and develop IT infrastructure in different projects
- To develop strategies to calculate risk factors involved in IT projects
- To use project management software to control the design, implementation, closure, and evaluation of IT projects
- To estimate, plan, calculate, and adjust project variables.
- Apply project management practices to launch new programs, initiatives, products, services, and events relative to the needs of stakeholders.

Course Title:-CSDT124: Project (Choice Based Optional Paper) Course

Outcomes:-

- To demonstrate a depth of knowledge of modern technology.
- To complete an independent research project, resulting in at least a thesis publication, and research outputs in terms of publications in high impact factor journals, conference proceedings, and patents.
- Students will acquire the skills to communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.
- Students will be able to learn on their own, reflect on their learning and take appropriate actions to improve it.

Course Title:-CSDT124: Human Computer Interaction (Choice Based Optional Paper)

Course Outcomes:-

- Apply an interactive design process and universal design principles to designing HCI systems.
- To analyze and discuss HCI issues in groupware, ubiquitous computing, virtual reality, multimedia, and Word Wide Web-related environments.
- Explain the importance of iteration, evaluation and prototyping in interaction design
- To analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.

Course Title:-CSDT124: Soft Computing (Choice Based Optional Paper) Course

Outcomes:-

- To discuss the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
- To relate with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems
- To describe with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations

Course Title:-CSUP125: Practical on Advanced OS & Mobile Technologies Course

Outcomes:-

- Student can understand internal structure and operations of OS along with various processes including threading, inter process communication and synchronization with I/O operations.

- Awareness of computational issues, resources in distributed environment.
- To develop mobile computing applications by analyzing their characteristics and requirements, selecting the appropriate computing models and software architectures, and applying standard programming languages and tools.
- To understand how the underlying wireless and mobile communication networks work, their technical features, and what kinds of applications they can support.

M.Sc. (Computer Science) Sem – III

Course Title:-CS 301: Software Metrics & Project Management

Course Outcomes:-

Student will able to:

- Get good knowledge of the issues and challenges faced while doing the Software project Management.
- To understand why majority of the software projects fails and how that failure probability can be reduced effectively.
- To do the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation using different techniques.
- Students will learn a good communication skill, improve presentation and team forming ability

Course Title:-CS 302: Mobile Computing

Course Outcomes:-

Student will able to:

- Get familiar with various generations of mobile communications.
- Understand the concept of cellular communication
- Understand the basics of wireless communication
- Get the Knowledge of GSM mobile communication standard, its architecture, logical channels, advantages and limitations.
- Develop ability to develop Android Application

Course Title:-CS 303: Soft Computing

Course Outcomes:-

Student will able to:

- Understand the basic areas of Soft Computing including Artificial Neural Networks, Fuzzy Logic and Genetic Algorithms.
- Provide the mathematical background for carrying out the optimization associated with neural network learning.
- Familiar with current research problems and research methods in Soft Computing by working on a research or design project.
- Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.

Course Title:-CS-304: Project (Elective)

Course Outcomes:-

- On successful completion of the course students will be able to:
- Demonstrate a sound technical knowledge of their selected project topic.
- Undertake problem identification, formulation and solution.
- Design engineering solutions to complex problems utilizing a systems approach.

- Conduct an engineering project
- Communicate with engineers and the community at large in written or oral forms.
- Demonstrate the knowledge, skills and attitudes of a professional engineer.
- Project-based learning connects students to the real world.
- Prepares students to accept and meet challenges in the real world, mirroring what professionals do every day.

Course Title:-CS -305: Web Services (Elective)

Course Outcomes:-

Student will able to:

- Understand Web Services and implementation model for SOA (Service Oriented Architecture)
- Understand cloud computing as a web service.
- Implement concepts of virtualization and data in cloud.
- Understand the use of web services in B2C and B2B applications.
- Will be able to implement an application that uses multiple web services in a realistic business scenario.

Course Title:-CS -306: Database and System Administration (Elective)

Course Outcomes:-

Student will able to:

- Establish a basic understanding of the process of Database Development and Administration using MySQL.
- Student will implement the concepts of both Operating Systems & Database Administration skills.
- Retrieve any type of information from a data base by formulating complex queries in MySQL
- Describe the important role of Linux operating system.

M.Sc. (Computer Science) Sem – IV

Course Title: - CS-401: Industrial Training

Course Outcomes:-

- On successful completion of the course students will be able to:
- Capability to acquire and apply fundamental principles of engineering.
- Become master in specialized technology
- Become updated with all the latest changes in technological world.
- Ability to communicate efficiently.
- Ability to be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills.
- Ability to identify, formulate and model problems and find engineering solution based on a systems approach.
- Capability and enthusiasm for self-improvement through continuous professional development and life-long learning
- Awareness of the social, cultural, global and environmental responsibility as an engineer.

Rajgad Dnyanpeeths
Anantrao Thopte College, Bhore
DEPARTMENT OF ENGLISH

BA English

Programme Outcomes

After successfully completing B.A. English Programme students will be able to:

PO1: Critical Thinking: Analyse works of literature by employing various important critical approaches and their tenets. The students will be able to implement literary devices to discuss literary texts among their peers. They will be able to familiarize themselves with the terminology in critical appreciation of varied forms of literature.

PO2: Comprehension Skills: The students will be able to comprehend the evolution of different categories of literature such as short story, drama, poetry, fiction and non-fiction.

PO3: Effective Communication: The students will be able to develop oral and written communication skills in English. They will be able to enrich their vocabulary and its usage in communication. The students will be able to apply grammatical rules to day to day spoken and written language.

PO4: Effective Communication: Capable of oral and written scientific communication, and will prove that they can think critically and work independently

PO5: Social Interaction: The students will be able to use interpersonal and intrapersonal communication skills to interact effectively in social situations like interviews, group discussions, seminars etc.

PO6: Effective Citizenship: The students will be able to execute their duties and responsibilities as citizens successfully by being a part of larger community.

PO7: Ethics: The students will be able to perceive the complexities of human behavior and identity through various forms of literature. They will be able to develop a deeper understanding of human values such as morality, empathy, good will etc.

PO8: Environment and Sustainability: The students will become aware about the issues related to environment and the steps needed to be implemented for its sustainability through the study of texts with ecological elements and dimensions.

PO9: Self-directed and Life-long Learning: The students will be able to grasp excellent pieces of prose and poetry in English whereby each and every lesson will be a lesson in life-long learning.

Programme Specific Outcomes

PSO 1: Students will be able to understand the evolution of criticism and its application in language and literature

PSO 2: Students will be able to comprehend excellent pieces of prose and poetry in English literature.

PSO 3: Students will be able to apply knowledge of English language to improve skills in

Listening, Speaking, Reading and Writing

F.Y.B.A. English

Course: 11011 Compulsory English

After successfully completing this course, students will be able to:

- CO1: Realize the beauty and communicative power of English
- CO2: Instill human values and develop the character of students
- CO3: Develop the ability to appreciate ideas and think critically
- CO4: Enhance employability of the students
- CO5: Apply the knowledge of language in day-to-day conversation

Course: 11332 Optional English

After successfully completing this course, students will be able to:

- CO1: Identify minor forms of literature in English
- CO2: Interpret poems and discuss the literary devices used in the poems.
- CO3: Analyze the basics of phonology of English
- CO4: Improve language skills
- CO5: Determine the elements of a short story one act play.
- CO6: Analyze the sound system of the English language.
- CO7: Develop literary competence in students to help them derive pleasure by reading the prescribed texts.

S.Y.B.A. English

Course: CC (Core Course) Compulsory English

After successfully completing this course, students will be able to:

- CO1: Expose the best examples of literature in English
- CO2: Describe and give examples of different types of characters, situations, and values of life.
- CO3: Develop effective communication skills by developing ability to use right words in the right context.
- CO4: Demonstrate competence in usage of language in day-to-day life.
- CO5: Classify and transform different types of sentences and apply vocabulary in communication

CO6: Relate to real life situation.

CO7: Compose and draft letters and essays and reports.

Course: 2337 Skill Enhancement Course-SEC-1A Advanced Study of English Language

After successfully completing this course, students will be able to:

CO1: Familiarize the various components of language.

CO2: Develop overall linguistic competence

CO3: Explain and give examples of varied intonation pattern and varieties of English

CO4: Name and label different organs of speech and transcribe words in the phonetic script.

CO5: Introduce some advanced areas of language study.

CO6: Prepare to go for detailed study and understanding of language.

Course: Discipline Specific Course (DSC-1A) Appreciating Drama

After successfully completing this course, students will be able to:

CO1: Define drama as a genre of literature and to identify different elements of drama.

CO2: Interpret the prescribed plays by applying the theory of drama.

CO3: Evaluate drama as a genre of literature.

CO4: Analyze independently different scenes and acts of the play

CO5: Compare and contrast different characters in the play

CO6: Develop literary competence in students to help them derive pleasure by reading the prescribed texts.

CO7: Evaluate the prescribed plays by categorizing their types.

Course: Discipline Specific Course (DSC-2A) Appreciating Poetry

After successfully completing this course, students will be able to:

CO1: Recall the basics of poetry as one of the literary forms.

CO2: Identify various elements of poetry.

CO3: Describe the various types of poetry in English.

CO4: Appreciate and critically evaluate poetry independently

CO5: Discuss various literary devices in a poem.

CO6: Illustrate different figures of speech.

CO7: Critically appreciate a poem

CO8: Develop the terminology in poetry criticism

Course: Skill Enhancement Course-(SEC-2A & 2B) A Certificate Course in Skill Development

After successfully completing this course, students will be able to:

CO1: Enhance the skill of using English for everyday communication

CO2. Acquaint with the verbal and nonverbal communication

CO3. Create opportunities to access exposure of speaking in various contexts

CO 4. Acquaint and familiarize the students with soft skills

CO 5. Develop interest among the students to interact in English

T.Y.B.A. English

Course: CC (Core Course) Compulsory English

After successfully completing this course, students will be able to:

CO1: Analyse the excellent pieces of prose and poetry in English

CO2: Become competent and effective users of English in real life situations.

CO3: Develop humanitarian values and foster sympathetic attitude

CO4: Develop practical writing skills required in work environment.

CO5: Impart knowledge of some essential soft skills

CO6: Apply sentence transformation in given format.

Course: Skill Enhancement Course (SEC 1-C & SEC 1-D) Enhancing Employability Skills

After successfully completing this course, students will be able to

CO1: Get the awareness of career opportunities available to them.

CO2. Identify the career opportunities.

CO3. Understand the use of English in different careers.

CO4. Develop competence in using English for the career choice.

CO5. Enhance skills required for the placement.

CO6. Use English effectively in the choose career

CO 7. Exercise verbal as well as nonverbal communication effectively .

Course: Discipline Specific Elective (DSE-1C& DSE-1D) Appreciating Novel

After successfully completing this course, students will be able to:

CO1: Define different forms of novels.

CO2: Discuss the evolution of novel as a genre.

- CO3: Comprehend various elements of a novel with varied examples in the literary canon.
- CO4: Apply critical theories to the study of novel with reference to the prescribed texts.
- CO5: Associate the study of novel with reference to historical, social, political context
- CO6: Compare and contrast the prescribed novels in the syllabus.

Course: Discipline Specific Elective (DSE-2C & DSE-2D) Introduction to Literary Criticism

After successfully completing this course, students will be able to:

- CO1: Define criticism and identify different types of criticism
- CO2: Outline the history of English literary criticism
- CO3: Analyse independently prose passages and poems
- CO4: Compare and contrast different critical theories
- CO5: Develop literary competence in students to help them derive aesthetic pleasure from different genres of literature.
- CO6: Evaluate different critics and their theories
- CO7: Develop aptitude for critical analysis

Course: Skill Enhancement Course (SEC 2-C & SEC 2-D) Mastering Life Skills and Life Values

After successfully completing this course, students will be able to:

- CO1: Equip the students with the social skills
- CO2. Train the student's interpersonal skills
- CO3. Build self-confidence and communicate effectively
- CO4. Encourage to think critically
- CO5. Learn stress management and positive thinking
- CO6. Enhance leadership qualities
- CO7. Aware about universal human values
- CO 8. Develop overall personality

DEPARTMENT OF GEOGRAPHY

B. A. Geography

Programme Outcomes

After successfully completing B.A. Geography Programme students will be able to:

- PO1: Apply qualitative and quantitative research techniques to gather and analyse data on social, cultural, and ecological problems.
- PO2: Apply clear written and oral communication skills to communicate results of research.
- PO3: Demonstrate connections between everyday life at the local scale and the larger economic, social, and/or environmental forces that network them into a global community.
- PO4: Evaluate cultural, social, and environmental processes with a particular focus on space and place, critical theory, practical application, analysis and/or social justice.
- PO5: Think in spatial terms to explain what has occurred in the past as well as using geographic principles to understand the present and plan for the future.
- PO6: Present completed researches, including an explanation of methodology and scholarly discussion, both orally and in written form and, wherever possible, utilize cartographic tools and other visual formats.
- PO7: Demonstrate general understanding of how the physical environment, human societies, and local and global economic systems are integral to the principles of sustainable development.
- PO8: Demonstrate acquisition of Weather chart/map, map aerial photograph and Image reading skill.
- PO9: Apply Remote sensing concepts, techniques and their application.
- PO10: Develop research questions and critically analyse both qualitative and quantitative data to answer those questions using various theoretical and methodological approaches in both physical and human geographies.
- PO11: Develop a general understanding of global human population patterns, factors influencing the distribution and mobility of human populations including settlement and economic activities and networks, and human impacts on the physical environment.
- PO12: Read, interpret, and generate maps and other geographic representations as well as extract, analyse, and present information from a spatial perspective

Programme Outcomes

After completing B. A. Geography programme will have

- PSO1: Demonstrate understanding of principles and theories of Geography. This include Physical Geography, Economic Geography, Geography of Maharashtra, Geography of Disaster Management and Geography of India.
- PSO2: Apply Statistical Techniques of Spatial Analysis.
- PSO3: Demonstrate ability to apply knowledge learned in classroom to set and perform simple laboratory experiments in geography.

Course Outcomes

F. Y. B. A. Geography

Course Gg-110(A) Physical Geography (Sem-I)

The student who successfully completes this course can able to:

- CO1: Explain Definitions of Physical Geography, Nature and scope of Physical Geography, Branches of Physical Geography and Introduction about the Earth system.
- CO2: Discuss Interior of the earth, Wegner's Continental Drift Theory and Davis Concept of Cycle of erosion.
- CO3: Identify different Structure of the atmosphere, Heat Balance, Pressure belts and wind system, Forms and types of Precipitation.
- CO4: Describe importance of Hydrological cycle, General structure of ocean floor, Waves and Tides, Field Visit for observations geographical places and landforms.

Course Gg-110(B) Human Geography (Sem-II)

The student who successfully completes this course can able to:

- CO1: Explain Definitions of Human Geography, Nature and scope of Human Geography and Branches and importance of Human Geography.
- CO2: Discuss Factors affecting on distribution of population, Theory of demographic transition and Composition of Indian population.
- CO3: Describe Types and pattern of rural Settlements, Urbanisation in India and Urbanisation in Maharashtra.
- CO4: Discuss Types of Agriculture, Factors affecting on Agriculture activity and Problems of Indian agriculture.

S. Y. B. A. Geography

Course Gg: 210(A) Economic Geography –I (G2) (Sem-III)

After successfully completing this course, students will be able to:

- CO1: Describe Definition, nature and scope of economic geography, Need and significance of economic geography, Economic geography and its relation with social sciences and Approaches of the study of economic geography.
- CO2: Explain Introduction and concept of economic activity with problems and prospect, Primary activity, Secondary activity and Tertiary activity.
- CO3: Implement Concept of resources, Renewable energy Resources- (Hydroelectricity, Solar energy, Wind energy), Non-renewable Resources- (Coal, Iron ore, and Mineral oil) and Conservation of resources.
- CO4: Explain Role of Agriculture in Indian economy, Factors influencing agriculture in India- (Physical, Socio-economic, Political and cultural), Agro-based industries in India- (Dairy industry, Cotton industry) and Agro –Tourism.

Course Gg: 210(A) Economic Geography –II (G2) (Sem-IV)

After successfully completing this course, students will be able to:

- CO1: Describe Modes of Transportation and their cost effectiveness Significance of – (Road, Rail, and Air), Transportation cost of Major types, Types of Trade- (National, International) and International trade of India.
- CO2: Explain Factors influencing on location of industries, Weber's theory of industrial location, Major industrial regions in India and Iron and steel industry in India, Sugar Industry in Maharashtra.
- CO3: Demonstrate Concept of regional planning and development. Their importance, Objectives of regional planning and Regional and sectoral imbalance in India.
- CO4: Explain Concept of rural development, Index of rural development, various schemes of government for rural development, IRD Programme, DPAD Programme

Course Gg: 220(A) Geography of Maharashtra – I (S-1) (Sem-III)

After successfully completing this course, students will be able to:

- CO1: Explain Historical and Political Background of the state, Geographical location of State, Adjoining States and Administrative Divisions.
- CO2: Describe Geological Structure of Maharashtra, Physical Structure (Mountain, plateau, Plains), Drainage Pattern (East and West flowing rivers) and Major Soil types and Distribution.
- CO3: Explain Climatic Regions of Maharashtra, Distribution of Rainfall, Draught prone areas- Problems and Management and Flood areas - Problems and Management.
- CO4: Describe Water: Problems in Utilization and conservation, Forest: Types and Conservation, Mineral; Iron ore, Manganese and Bauxite and Power: Hydro, Thermal, Atomic

Course Gg: 220(B) Geography of Maharashtra – II (S-1) (Sem-IV)

After successfully completing this course, students will be able to:

- CO1: Explain Importance of Agriculture in Economy of Maharashtra, Major Crops - Wheat, Rice, Jawar, Bajra, Cash Crops and Horticulture - Cotton, Sugarcane, Pomegranate, Grapes, and Problems of agriculture in Maharashtra..
- CO2: Describe Population distribution of Maharashtra, Population composition - Sex Ratio, Literacy, Occupational structure, Migration, Rural and Urban Settlements and Potential of Major Cities in Maharashtra – Mumbai, Pune, Nagpur.
- CO3: Explain Concept of Rural Development, Parameters of Rural Development, and Schemes For Rural Development, Case Studies – Hivare Bazar and Ralegan Siddhi (Ahmednagar), Patoda (Aurangabad).
- CO4: Describe Growth and development of tourism in Maharashtra, Tourism Potential of Maharashtra, Agro-Tourism and Role of MTDC

Gg: 201(A) Practical Geography – I (Scale and Map Projections) (S-2) (Sem-III)

After successfully completing this course, students will be able to:

- CO1: Explain Definition of Map, Elements of Map, Classification of Map: - On the basis of scale: - (Small scale, Large Scale), On the basis of function: - (Physical, Cultural) and Use of map.
- CO2: Explain Definition of Map Scale, Types of Map Scale- (Verbal Scale, Numerical Scale and Graphical Scale), and Conversion Scale (British and Metric System) (Verbal scale to Representative fraction, Representative fraction into Verbal scale) and Construction of Simple Graphical scale
- CO3: Identify different Definition and types of map projection, Basic Concepts of Projection: Latitude, Longitude, Parallel of latitude, Meridian of longitude, Prime meridian, Equator, Direction and Calculation of time basis on meridian and GMT.
- CO4: Describe Zenithal Projection, Zenithal Polar Gnomonic Projection, and Conical Projection, Conical projection with one standard parallel/Simple conical projection, Cylindrical Projection, Cylindrical equal area projection and Mercator projection.

Gg: 201(B) Practical Geography – II (Cartographic Techniques, Surveying and Excursion / Village / Project Report) (S-2) (Sem-IV)

After successfully completing this course, students will be able to:

- CO1: Explain. Definition of Cartography, Development of cartography- (Traditional b. Modern) and Use of Cartography.
- CO2: Explain. Techniques of representation of data, Simple line graph, Simple bar Graph, Pie diagram, Choropleth Map.
- CO3: Demonstrate preparation of drawing profile with the help of Dumpy Level.
- CO4: Conduct geographical field investigation and report writing.

Course SEC – A Applied Course of Disaster– I (SEC-I) (Sem-III)

After successfully completing this course, students will be able to:

- CO1: Explain Disaster, Hazard, Risk, Vulnerability, Resilient, Magnitude, Intensity, Frequency, Duration, Spatial dispersion.
- CO2: Describe Concept: Mitigation, Preparedness, Response, Recovery, and Rehabilitation. And Role of Geographers.
- CO3: Explain Earthquake: - India and Japan and Flood:- India and Netherland.
- CO4: Describe Assignment based on Primary or secondary data on any one Geographical scale, local/ regional/national/ global.

Course SEC – B APPLIED COURSE OF Travel & Tourism– II (SEC-I) (Sem-IV)

After successfully completing this course, students will be able to:

- CO1: Explain Basic concepts: Travel & Tourism, Types of Tourist and Tourism and Types of transportation.
- CO2: Describe Concept and need of local tourism and Introduction to local tourist places.
- CO3: Explain Basic skills: Communication, Time Management, Computer operating, online booking, Net banking, Cancellation of booking and ticket, etc, Framing the tour plan (Itinerary): Budget (Costing), Duration, Insurance, Route and other requirements for individual, family, group and mass level tours and Promotion of tourism.
- CO4: Describe one short tour and Preparation of tour report.

T.Y.B.A. Geography

Course Gg 310 A: Geography of Disaster Management-I (G-3) (Sem-V)

After successfully completing this course, students will be able to:

- CO1: Describe Meaning and definition of Hazards and Disasters Geographical conditions and disasters and Classification of Disasters.
- CO2: Explain Concept of management, Aims and objectives and Pre-disaster management and Post – disaster management.
- CO3: Explain Structure of disaster management - Preparedness, Response, Recovery, and Mitigation, and Rehabilitation, Standard operating procedure of disasters management on government level and Role of media.
- CO4: Describe Hail Storm and Cloud Burst, Tropical Cyclones and Storms and Droughts and Floods.

Course Gg 310 B: Geography of Disaster Management-II (G-3) (Sem-VI)

After successfully completing this course, students will be able to:

- CO1: Describe Earthquakes, Landslides and Tsunami.
- CO2: Explain Deforestation, Forest fire and Soil degradation.
- CO3: Explain Global warming, Ozone depletion and Marine Pollution.
- CO4: Describe Tsunami in Indian Ocean -2004, Fukushima Nuclear Disaster - 2011 and Kedarnath Cloud Burst -2013.

Course Gg: 320 A: Geography of India –I (S-3) (Sem-V)

After successfully completing this course, students will be able to:

- CO1: Explain Location and Extent, Historical Background, International boundaries of India and related issues and States and Union territories
- CO2: Discuss The Northern Mountains, The North Indian Plains, The Peninsular Plateau and The Coastal lowlands and Islands.

CO3: Explain Himalayan Rivers: Indus, Ganga, Brahmaputra, East Flowing Rivers: Mahanadi, Godavari, Krishna, Kaveri, Major West Flowing Rivers: Narmada, Tapi, Mahi and Minor West Flowing Rivers: originating in Western Ghat.

CO4: Discuss Various Seasons and Weather Associated with them, Types of Soils and its Distribution and Types of Natural Vegetation and its Distribution.

Course Gg: 320 B: Geography of India –II (S-3) (Sem-VI)

After successfully completing this course, students will be able to:

CO1: Explain Religions of India, Languages of India and Major tribes, tribal areas and their problems: Naga and Gond Tribe.

CO2: Discuss Land ways, Airways and Waterways, Role of Transportation in regional development of India and Developments in communication technology.

CO3: Explain Iron ore and Manganese, Coal and Petroleum and Hydro Power and Thermal Power.

CO4: Discuss Significance of agriculture in Indian Economy, Agro Based Industries: Sugar, Cotton and Textile and Agriculture Revolution in India: Green, White and Blue.

Course Gg-301 A: Practical Geography – I (Techniques of Spatial Analysis) (S-4) (Sem-V)

After successfully completing this course, students will be able to:

CO1: Explain Introduction of S.O.I. Topsheet and Relief Representation.

CO2: Identify Interpretation of S.O.I. Topsheets and Data generation.

CO3: Describe Introduction and Interpretation Weather Maps.

CO4: Describe Introduction and Application of GIS and Remote Sensing Techniques.

Course Gg-301 B: Practical Geography – II (Techniques of Spatial Analysis) (S-4) (Sem-VI)

After successfully completing this course, students will be able to:

CO1: Explain Geographical Data and its Basic Analysis.

CO2: Identify Measures of Central Tendency and Dispersion.

CO3: Describe Testing and Application of Hypothesis.

CO4: Describe Field Excursion / Village Survey.

Course SEC 2C Research Methodology – I (Sem-V)

After successfully completing this course, students will be able to:

CO1: Explain Meaning and Objectives of Research, Characteristics of Research, Types of Research and Various Steps in Research Process.

CO2: Describe Introduction of Research Design, Purpose of Research Design and Characteristics of Good Research Design.

CO3: Explain Definitions of Research Problem, Identification of a Research Problem and Technique Involved in Defining a Research Problem.

Course SEC 2C Research Methodology – II (Sem-V)

After successfully completing this course, students will be able to:

CO1: Explain Methods of Data Collection.

CO2: Describe Types of Research Report.

CO3: Explain Techniques of Research Report Writing.

Programme Outcomes

After successfully completing M.A. Geography Programme students will be able to:

- PO1: Apply qualitative and quantitative research techniques to gather and analyze data on social, cultural, and ecological problems.
- PO2: Apply clear written and oral communication skills to communicate the results of research.
- PO3: Demonstrate connections between everyday life at the local scale and the larger economic, social, and/or environmental forces that network them into a global community.
- PO4: Evaluate cultural, social, and environmental processes with a particular focus on space and place, critical theory, practical application, analysis and/or social justice
- PO5: Think in spatial terms to explain what has occurred in the past as well as using geographic principles to understand the present and plan for the future.
- PO6: Present completed research, including an explanation of methodology and scholarly discussion, both orally and in written form and, wherever possible, utilize cartographic tools and other visual formats.
- PO7: Demonstrate general understanding of how the physical environment, human societies, and local and global economic systems are integral to the principles of sustainable development.
- PO8: Demonstrate acquisition of Weather chart/map, map aerial photograph and Image reading skill.
- PO9: Apply Remote sensing concepts, techniques and their application.
- PO10: Develop research questions and critically analyze both qualitative and quantitative data to answer those questions using various theoretical and methodological approaches in both physical and human geographies.
- PO11: Develop a general understanding of global human population patterns, factors influencing the distribution and mobility of human populations including settlement and economic activities and networks, and human impacts on the physical environment.
- PO12: Read, interpret, and generate maps and other geographic representations as well as extract, analyze, and present information from a spatial perspective

Programme Specific Outcomes

After completing **M.A. Geography** course students will have

- PSO1: Knowledge of geographical terms, concepts and Theories.
- PSO2: Ability of explanation of correlation between geographical facts and processes.
- PSO3: Development of map preparation and map reading skills.
- PSO4: Understanding of Regional Geography of India.
- PSO5: Ability to use geographical research methodologies and research projects.

Course Outcomes

MA Geography Part I

Course GGUT-111: Principles of Geomorphology (Sem-I)

The student who successfully completes this course can able to:

- CO1: Explain principal terms, definitions, concept and theories of Geomorphology.
- CO2: Describe internal structure of the Earth and Geomorphology and Tectonics.
- CO3: Explain Weathering and Mass Movement Processes.
- CO4: Describe the Hillslope processes and forms and Models of hillslope evolution.
- CO5: Describe the Fluvial Processes and Landforms and River and stream, drainage basin and drainage network patterns.
- CO6: Apply knowledge of Glacial Processes and Landforms.
- CO7: Apply knowledge of Coastal Processes and Landforms.
- CO8: Aeolian Processes and Landforms.

Course GGUT- 112: Principles of Climatology (Sem-I)

The student who successfully completes this course can able to-

- CO1: Explain Meteorology and Climatology, Nature and Scope of Climatology, Development of Climatology and Tropical Climatology.
- CO2: Describe composition and Structure of Earth Atmosphere
- CO3: Explain electromagnetic spectrum, its effect on earth atmosphere and types of insulation.
- CO4: Explain basic concepts of air temperature, air pressure and its measurement.
- CO5: Explain basic concepts of wind and wind measurement.
- CO6: Describe scales of Atmospheric Motion and Models of air circulation.
- CO7: Explain basic concepts of hydrological cycle, condensation and evaporation.
- CO8: Describe Lapse Rate: normal, environmental, dry adiabatic lapse rate and wet adiabatic lapse rate.
- CO9: Explain of Air Masses and Fronts.

Course: GGUT-113: Principles of Economic Geography (Sem-I)

After successfully completing this course, students will be able to:

- CO1: Explain principal terms, definitions, concept, nature, scope and recent trends in Economic Geography.
- CO2: Discuss Definition and classification of economic activities, and Location of economic activities.
- CO3: Explain Significance of natural and human resources in economic development.
- CO4: Describe resources and explain significance of natural and human resources in economic development.
- CO5: Describe different Transport and Communication.
- CO6: Explain Problems and prospects of international trade with reference to India.
- CO7: Describe Economic Development in India.
- CO8: Role of IT industry in economic development in Maharashtra.

Course GGDT-114: Principles of Population and Settlements Geography (Sem-I)

The student who successfully completes this course can able to:

- CO1: Explain Introduction to Population and Settlement Geography
- CO2: Describe Population distribution and factors affecting distribution of population
- CO3: Identify various Population Growth and trend.
- CO4: Evaluate effects of Age and sex structure, Concept of aging of populations and Dependency ratio.
- CO5: Level and trends of mortality in India.
- CO6: Types: compact, semi-compact, helmed and dispersed.
- CO7: Factors affecting dispersion and nucleation.
- CO8: Explain Concept: urban place, urban agglomeration, urban sprawl.

Course: GGUP-115: Practical in Physical and Human Geography (Sem-I)

After successfully completing this course, students will be able to:

- CO1: Demonstrate Horton and Strahler methods of stream ordering.
- CO2: Describe drainage network analysis and drainage basin relief analysis.
- CO3: Demonstrate climatic diagrams.
- CO4: Describe climatic classification of Koppen and Thornthwaite.
- CO5: Explain the Crop Combination and Crop Diversification.
- CO6: Describe Measures of Network Structure.
- CO7: Describe Population Indices and Projection.
- CO8: Measures of Nucleation and Dispersion.
- CO9: Assess the language used to describe Geography experiments and how it can alter perceptions of the method and results.

Course: GGUT-121: Geoinformatics-I (SEM-II)

After successfully completing this course, students will be able to:

- CO1: Explain Elements of GIS, hardware & software requirements.
- CO2: Explain Importance of Non-spatial: nominal, ordinal, ratio and cyclic.
- CO3: Explain Spatial and Non-spatial Data Models.
- CO4: Describe the Structuring of Spatial Data.
- CO5: Explain Attribute databases: operations from algebraic theory.
- CO6: Spatial Databases: map algebra, grid Operations: Local, Focal

Course: GGUT- 124: Agricultural Geography (SEM-II)

After successfully completing this course, students will be able to:

- CO1: Explain Approaches: systematic, commodity, regional, recent.
- CO2: Explain Significance of agriculture in world.
- CO3: Describe the Determinates of Agriculture.
- CO4: Explain Agricultural efficiency: Kendall's ranking coefficient, Bhatia's method.
- CO5: Describe the Problems and prospects with reference to India.
- CO6: Explain the Sustainable Agricultural Development in India.
- CO7: Describe the Green revolution in India: problems associated with Indian agriculture.
- CO8: Describe the Recent changes in Indian agriculture.

Course: GGUT-128: Industrial Geography (SEM-II)

After successfully completing this course, students will be able to:

- CO1: Explain Manufacturing and regional economies.
- CO2: Explain Factors of industrial location: physical, economic, political.
- CO3: Describe the Models in Industrial Geography.
- CO4: Explain Problems and Prospects of Industries in India.
- CO5: Describe the Industrial regions of India.
- CO6: Explain the Industrial Regions in Western Europe, Anglo-America, Japan and China.
- CO7: Describe the Impact of globalization on IT industry in India.
- CO8: Describe the Currents Scenario of Industry Sector in India.

Course: GGDT-132: Geography of Disaster Management (SEM-II)

After successfully completing this course, students will be able to:

- CO1: Explain Disaster, Hazard, Vulnerability, Resilience, Risks.
- CO2: Explain Natural Disasters Causes and effects.
- CO3: Describe the Man-made disaster Causes and effects.
- CO4: Explain Role of Armed forces, police forces and NGO'S in disaster management.
- CO5: Describe the Uses of remote sensing, GIS and GPS in disaster management.

Course: GGDP-133: Practical in Map Projections (SEM-II)

After successfully completing this course, students will be able to:

- CO1: Explain Types- Perspective and non- perspective, conventional.
- CO2: Explain the Zenithal Projections in Zenithal Polar Gnomonic Projection.
- CO3: Describe the Polyconic Projection and International Map Projection.
- CO4: Explain the Universal Transverse Mercator (UTM) Projection
- CO5: Describe the Conventional Map Projections.

Course: GGDP-133: Practical in Map Projections (SEM-II)

After successfully completing this course, students will be able to:

- CO1: Explain Introduction to Statistical Techniques in Geography.
- CO2: Explain the Introduction to descriptive statistics.
- CO3: Describe the Probability and Probability Distributions.

- CO4: Explain the Introduction to inferential statistics and Population and sample.
- CO5: Describe the Introduction to bi-variate correlation and regression.
- CO6: Explain the Introduction and definition of time.
- CO7: Describe the Analysis of data by using appropriate statistical technique.

M. A. Geography Part II

Course GGUT-235 Geoinformatics II (SEM-III)

After successfully completing this course, students will be able to:

- CO1: Remote Sensing: definition, concept and principles and History and development of Remote Sensing in India.
- CO2: Explain EM Radiation and EM Spectrum.
- CO3: Platform: Types and characteristics and Satellites: Geo-stationary and Sun synchronous.
- CO4: Describe Sensors: Across track (whiskbroom) and along track (pushbroom) scanning.
- CO5: Explain Spatial Resolution, Spectral Resolution, Temporal Resolution and Radiometric Resolution
- CO6: Describe Techniques of visual interpretation and interpretation keys
- CO7: Types of Aerial Photographs Based on Scale, Geometry of an aerial photograph.

Course: GGUT-236 Geographical Thoughts (SEM-III)

After successfully completing this course, students will be able to:

- CO1: Explain the Historical Development of Geographical Thought.
- CO2: Explain the Dualism in Geography Paradigms.
- CO3: Describe the System approaches and Models in Geography.
- CO4: Describe the Quantification and application of statistical techniques in Geography.
- CO5: Explain the Application in land-use planning, regional planning and urban planning, resource management, environmental management, natural hazards, scenic evaluation.

Course: GGUT-239 Geography of Rural Development (SEM-III)

After successfully completing this course, students will be able to:

- CO1: Describe Concept of Rural Development, Geography and Rural Development, Nature and Scope of Rural Development and Aims and Objectives of Rural Development.
- CO2: Explain the Factors affecting on Rural Development.
- CO3: Apply knowledge of Rural Basic Services and Infrastructures.
- CO4: Explain the Rural Development Planning.
- CO5: Apply knowledge of Government Policies and Rural Development.
- CO6: Explain the Role of Rural Institutions in Development.
- CO7: Explain the Application of computer and information technology in Rural Development.
- CO8: Explain the Problems and Prospects of Rural development in India.

Course GGUT-243 Watershed Management (SEM-III)

After successfully completing this course, students will be able to:

- CO1: Explain Definition, concepts of watershed; watershed management, Principle of watershed management
- CO2: Describe Characteristics: Size, Shape, Physiography, Climate, Drainage, Land use, Vegetation, Geology and Soils, Hydrology, Socioeconomics
- CO3: Explain Precipitation, interception, infiltration, evaporation, evapo-transpiration, surface runoff, ground water-flow, water budget.
- CO4: Describe Water and soil conservation in watershed.
- CO5: Describe Importance of watershed management in national development.

Course GGDP-244 Practical in Multivariate Statistics (SEM-III)

After successfully completing this course, students will be able to:

- CO1: Explain the Bivariate & Multivariate Analysis
- CO2: Describe Addition, subtraction and multiplication of matrices.
- CO3: Explain curvilinear bivariate Relationships, Computation, plotting and interpretation.
- CO4: Describe the Multivariate Analysis and Computation of multiple regression equations involving two and three independent variables.
- CO5: Describe the Importance of Trend surface analysis in the study of spatially distributed data. Examples of TSA.

Course: GGUP- 247 Practical in Economic Geography (SEM-III)

After successfully completing this course, students will be able to:

- CO1: Explain the Techniques in Agricultural Geography and Cropping Intensity and Irrigation Intensity
- CO2: Explain the Analyses Techniques in Industrial Geography.
- CO3: Apply knowledge of Techniques in Trade and Transportation Geography.
- CO4: Apply knowledge of Use of Thematic Maps in Economic Geography ii. Use of Choropleth Maps in Economic Geography iii. Use of GIS in Economic Geography.
- CO5: Draw DEM based set of profiles at an equal interval.
- CO6: Explain the Visit to one Agro-based Unit (Industry) and report writing.

Course: GGUT-249 Geography of India (SEM-IV)

After successfully completing this course, students will be able to:

- CO1: Explain Geographical and relative location of India, Frontiers of India and Strategic Significance and Geological Structure.
- CO2: Describe Main physiographic divisions & their importance.
- CO3: Explain the Drainage Systems, Himalayan drainage systems, peninsular drainage system and West Flowing Rivers.
- CO4: Apply knowledge Climate Main Seasons & Associated weather conditions.
- CO5: Describe Soil Major Soil types and their distribution in India.
- CO6: Explain Forest Deforestation and conservation of forest.
- CO7: Describe Distribution and Utilization of Minerals and Distribution and

- Utilization of Energy Resources
- CO8: Explain Distribution and Production of Major Crops and Agriculture revolution in India.
- CO9: Describe Major Industries in India, Major Industrial Regions in India and Problems of Industrial development.
- CO10: Explain Growth and distribution of population in India and Composition and structure of Population.

Course: GGUT–250 Oceanography (SEM-IV)

After successfully completing this course, students will be able to:

- CO1: Explain Definition and Meaning of Oceanography.
- CO2: Describe World Oceans, their origin and distribution.
- CO3: Explain the Ocean Floor Relief of the Ocean Bottom.
- CO4: Explain the Factors affect temperature on water and distribution.
- CO5: Describe Correlation and age determination.
- CO6: Explain Natural resources- gaseous, liquefied and solid chemical parameters.
- CO7: Describe Oceanic Pollution Causes and measures

Course: GGUT – 251 Research Methodology (SEM-IV)

After successfully completing this course, students will be able to:

- CO1: Explain the Introduction to Research Methodology and Types of Research.
- CO2: Describe Research Design – definition, Purpose of a Research Design and Characteristics of Good Research Design.
- CO3: Explain the Definitions of the Research Problem, Identification of a Research Problem and Technique involved in defining a problem.
- CO4: Explain the Types or method of sampling.
- CO5: Describe Methods of Data Collection.
- CO6: Explain Measure for Central Tendency and Dispersion and Correlation and Regression Analysis, Time series analysis.
- CO7: Describe Technical writing and reporting of research and Types of research report
- CO8: Explain Research ethics, plagiarism and funding agencies.

Course: GGUT – 254 Political Geography (SEM-IV)

After successfully completing this course, students will be able to:

- CO1: Explain the Historical Development of Political Geography.
- CO2: Describe Definition of Nation and State and Difference between Nation and State
- CO3: Explain the Definition of Frontiers & Boundaries ii. Difference between frontiers & boundaries.
- CO4: Explain the Geopolitical importance of Indian Ocean.
- CO5: Describe Contemporary Issues related to India and Problems of Border States of India.

Course: GGDP – 256 Practical in Watershed Analysis (SEM-IV)

After successfully completing this course, students will be able to:

- CO1: Explain the Delineation of Watershed/Drainage Basin.
- CO2: Explain the Measurement and calculation of Stream length, Mean stream length, and Stream length ratio.
- CO3: Explain the Explain the Relief Aspects of Drainage Basin.
- CO4: Explain the Software based Delineation of watershed (DEM based).

Course: GGUT-258 Geography of World (SEM-IV)

After successfully completing this course, students will be able to:

- CO1: Explain the Origin and Evolution of the Earth- Big-bang theory and Geological Time scale.
- CO2: Explain the Regional geography of Europe, North America, South America, and Africa and Australia.
- CO3: Describe the World contemporary issues.
- CO4: Describe the 21st century challenges and opportunities in the world.



अनंतराव थोपटे महाविद्यालया भोर

प्रथम वर्ष कला (F.Y.B.A.)

I-Sem

1 A वैकल्पिक हिंदी प्रश्नपत्र 11091 A

उद्देश

- 1) को हिंदी बाथरूम काव्य साहित्य का परिचय देना
- 2) हिंदी कहानी साहित्य से अवगत करना
- 3) हिंदी भाषा द्वारा संवाद कौशल विकसित करणे
- 4) मौलिक लेखन की ओर रुझान बढ़ाना
- 5) विज्ञापन लेखन कौशल विकसित करना
- 6) अनुवाद संबंधी जानकारी देना
- 7) हिंदी कम्प्यूटिंग का परिचय देना

II-Sem

1 B वैकल्पिक हिंदी प्रश्नपत्र 11092B

उद्देश

- 1) छात्रों को हिंदी काव्य साहित्य का परिचय देना
- 2) छात्रों को हिंदी कहानी साहित्य से अवगत कराना
- 3) निबंध लेखन कौशल को विकसित करना
- 4) छात्रों को विज्ञापन लेखन से अवगत करना

S.Y.B.A.

III-Sem

G2 -23093 आधुनिक काव्य कहानी तथा व्यवहारीक हिंदी

उद्देश

- 1) छात्रों को काव्य साहित्य से परिचित कराना !
- 2) छात्रों को कहानी साहित्य से परिचित कराना !
- 3) छात्रों को हिंदीकारक व्यवस्था समजना !
- 4) शब्दयुग्म का अर्थ लिखकर प्रत्यक्ष वाक्य में प्रयोग समजना !
- 5) संक्षेपण लेखन का प्रत्यक्ष बोध कराना !
- 6) सर्जनात्मकता का विकास कराना !

IV-SEM

G2-24093 आधुनिक हिंदी व्यंग साहित्य तथा व्यवहारीक हिंदी

उद्देश

- 1) छत्र को व्यंग्य पाठ से परिचित कराना !
- 2) छात्रों को कहाणी व्यंग्य पाठका बोध कराना!
- 3) साक्षात्कार कला से अवगत करना!
- 4) भाषा का मोबाइल तंत्र समझाना!
- 5) पल्लवन कला से अवगत करना!

III-SEM

S1 - 23091-काव्य शास्त्र

उद्देश

- 1) भारतीय काव्यशास्त्र का परिचय देना!
- 2) काव्य परिभाषा तत्त्व आदी अवगत कराना!
- 3) काव्य के तत्त्व शब्द शक्तियों का परिचय देना!
- 4) रस का स्वरूप समझना!
- 5) भारतीय काव्य शास्त्र में रुची पैदा करना तथा आलोचनात्मक दृष्टीको विकसित करना!

IV-SEM

24091-साहित्य के भेद

उद्देश

- 1) बाथरूम को साहित्य के भेद से अवगत कराना!
- 2) छात्रों को पद्य भेद से अवगत कराना!
- 3) नाटक का स्वरूप समझाना!
- 4) नाटक का स्वरूप समझाना!
- 5) छात्रों में नाट्य अभिनय की रुची विकसित करना!

III-SEM

S2- 23092 मध्ययुगीन काव्य तथा उपन्यास साहित्य

उद्देश

- 1) कबीर के साहित्य का परिचय देना!
- 2) मीराबाई के काव्य से अवगत कराना!
- 3) भारतीय उपन्यास की अवधारणा समझाना!
- 4) उपन्यास कृति का मूल्यांकन कला विकसित करना!
- 5) साहित्य कृतीयों प्रस्तुत जीवन मूल्य को आत्मविश्रुत करना!

IV-SEM

S3- 24092 मध्ययुगीन काव्य तथा नाटक साहित्य

उद्देश

- 1) रहीम के काव्य का बोधकराना!
- 2) बिहारी की काव्य अभिव्यंजना समझाना!
- 3) हिंदी नाटक और रंग मंच अवगत करना!
- 4) छात्रों में अभिनय गुण विकसित कराना!
- 5) नाट्यलोचन से अवगत कराना!

III-SEM

S2- 23092 मध्ययुगीन काव्य तथा उपन्यास साहित्य

उद्देश

- 1) कबीर के साहित्य का परिचय देना!
- 2)मीराबाई के काव्य से अवगत कराना!
- 3)भारतीय उपन्यास की अवधारणा समझाना!
- 4)उपन्यास कृति का मूल्यांकन कला विकसित करना!
- 5)साहित्य कृतीयो प्रस्तुत जीवन मूल्य को आत्मविश्रुत करना!

IV-SEM

S2- 24092 मध्ययुगीन काव्य तथा नाटक साहित्य

उद्देश

- 1)रहीम के काव्य का बोधकराना!
- 2)बिहारी की काव्य अभिव्यंजना समझाना!
- 3)हिंदी नाटक और रंग मंच अवगत करना!
- 4)छात्रो मे अभिनय गुण विकसित कराना!
- 5)नाट्यलोचन से अवगत कराना!

III-SEM

23096 अनुवाद स्वरूप एवं व्यवहार

उद्देश

- 1)अनुवाद कौशल से छात्रों को अवगत कराना!
- 2)अनुवाद का स्वरूप समझाना!
- 3)अनुवाद क्षेत्र से परिचय कराना!
- 4)हिंदी से मराठी मे प्रत्यक्ष अनुवाद कार्य कराना!
- 5)अंग्रेजी से हिंदी मराठी मे अनुवाद कौशल का विकास करना!

IV-SEM

24096 - माध्यम लेखन

उद्देश

- 1)छात्रों को माध्यम लेखन से परिचय कराना!
- 2)सृजनात्मक लेखन कौशल विकसित कराना!
- 3)माध्यम लेखन से अवगत कराना!
- 4)श्राव्य दृश्य माध्यमो की भाषा से अवगत कराना!

Rajgad Dnyanpeeths
Anantrao Thopte College, Bhor
DEPARTMENT OF HISTORY

B.A. History

Programme Outcomes

After successfully completing B.A. History Programme students will be able to:

- PO1: Apply qualitative and quantitative research techniques to gather and analyze data on social, cultural, and ecological problems.
- PO2: Apply clear written and oral communication skills to communicate the results of research.
- PO3: Demonstrate connections between everyday life at the local scale and the larger economic, social, and that network them into a global community.
- PO4: Evaluate cultural, social, and Historgraphic with a particular focus on space and place, critical theory, practical application, analysis and/or social justice.
- PO5: Think in spatial terms to explain what has occurred in the past as well as using Historiographic principles to understand the present and plan for the future.
- PO6: Present completed research, including an explanation of methodology and scholarly discussion, both orally and in written form and, wherever possible, utilize Historgraphic tools and other visual formats.
- PO7: Demonstrate general understanding of how the Historical, human societies, and local and global economic systems are integral to the principles of sustainable development.
- PO8: Demonstrate acquisition of chart/map and Image reading skill.
- PO9: Apply concepts and Theories, Historical terms.
- PO10: Develop research questions and critically analyze both qualitative and quantitative data to answer those questions using various theoretical and methodological approaches in Historical Research.
- PO11: Read, interpret and generate maps and other geographic representations as well as extract, analyze, and present information from a spatial perspective

Programme Outcomes

After completing B. A. History programme will have

- PSO1: The course is designed to make the students aware about the making of Modern India and the struggle for independence
- PSO2: To make the students aware of the multi-dimensionality of Mode.
- PSO3: To acquaint the students with various interpretative perspectives.

Course Outcomes

F.Y.B. A.History

Course11171: Early India: From Prehistory to the Age of the Mauryas (General-1)

The student who successfully completes this course can able to:

- CO1: The course is aimed at helping the student to understand the history of early India from the prehistoric times to the age of the Mauryas.
- CO2: It attempts to highlight the factors and forces behind the rise, growth and spread of civilization and culture of India along with the dynastic history.
- CO3: It also attempts to help the students to understand the contribution of Early Indians to polity, art, literature, philosophy, religion and science and technology.
- CO4: It also aims to foster the spirit of enquiry among the students by studying the major developments in early Indian history.

Course11172: Early India: Post Mauryan Age to the Rashtrakutas (General-1)

The student who successfully completes this course can able to:

- CO1: The course is aimed at introducing the students to the developments in different parts of India through a brief study of regional kingdoms up to the tenth century C.E.
- CO2: It attempts to highlight the consequences of the foreign invasions, particularly on the polity, economy, society and art and architecture.
- CO3: The attempt is also to instill the spirit of enquiry among the students.

S.Y.B.A. History

Course23171 (DSE- 1A) Medieval India - Sultanate Period (Sem-III)

After successfully completing this course, students will be able to:

- CO1: Provides examples of sources used to study various periods in history.
- CO2: Relates key historical developments during medieval period occurring in one place with another.
- CO3: Analyses socio - political and economic changes during medieval period
- CO4: Estimate the foreign invasion and the achievement of rulers

Course24171 (DSE- 1B) Medieval India - Mughal Period (Sem-IV)

After successfully completing this course, students will be able to:

- CO1: Draws comparisons between policies of different rulers.
- CO2: Understanding Role of Akbar in the consolidation of Mughal rule in India.
- CO3: Understand Aurangzeb's conflict with Rajputas, Maratha and weakening Mughals age.
- CO4: Analyses factors which led to the emergence of new religious ideas and movements (bhakti and Sufi)

Course23172 (DSE- 1A) Glimpses of the Modern World - Part I (Sem-III)

After successfully completing this course, students will be able to:

- CO1: It will enable students to develop the overall understanding of the Modern World.
- CO2: The students will get acquainted with the Renaissance, major political, socio-religious and economic developments during the Modern World.

- CO3: It will enhance their perception of the history of the Modern World.
- CO4: It will enable students to understand the significance of the intellectual, economic, political developments in the Modern World.

Course24172 (DSE- 1B) Glimpses of the Modern World - Part II (Sem-IV)

After successfully completing this course, students will be able to:

- CO1: It will enable students to develop the overall understanding of the Modern World.
- CO2: The students will get acquainted with the major nationalist movements, the World War II and its consequences, the Cold War and its Consequences.
- CO3: It will enhance their overall perception of the history of the Modern World.
- CO4: It will enable students to understand the significance of the strategic political developments in the Modern World

Course23174 (CC- 1C) History of the Marathas: (1630-1707) (Sem-III)

After successfully completing this course, students will be able to:

- CO1: Student will develop the ability to analyse sources for Maratha History.
- CO2: Student will learn significance of regional history and political foundation of the region.
- CO3: It will enhance their perception of 17th century Maharashtra and India in context of Maratha history.
- CO4: Appreciate the skills of leadership and the administrative system of the Marathas.

Course23174 (CC- 2C) History of the Marathas: (1707-1818) (Sem-IV)

After successfully completing this course, students will be able to:

- CO1: Students will be able to analyze the Marathas policy of expansionism and its consequences.
- CO2: They will understand the role played by the Marathas in the 18th century India.
- CO3: They will be acquainted with the art of diplomacy in the Deccan region.
- CO4: It will help to enrich the knowledge of the administrative skills and profundity of diplomacy.

Course23176 (SEC- 2A) Art and Architecture of Early India (Sem-III)

After successfully completing this course, students will be able to:

- CO1: Students will get an overall understanding of the emergence and development of the art and architecture in Early India.
- CO2: They will understand the emergence of the Pottery, Terracotta figures, Ornaments, Town Planning, preparation of seals and coins.
- CO3: They will have an understanding of the art and architecture in early India.

Course24176 (SEC- 2B) Medieval Indian Arts and Architecture (Sem-IV)

After successfully completing this course, students will be able to:

- CO1: Students will get an overall understanding of the development of the Medieval Art and Architecture.
- CO2: They will understand the changing patterns of the Art and Architecture during the Medieval India.
- CO3: They will have an understanding of the impact of Persian Art on Islamic Art and

Architecture in Medieval India.

T.Y.B.A. History

Course35171 (DSE- 3C) Introduction to Historiography (Sem-V)

After successfully completing this course, students will be able to:

- CO1: Students will be introduced to the information and importance of Historiography.
- CO2: Students will be introduced to the different Methods and Tools of data collection.
- CO3: Students can study the interdisciplinary approach of History.
- CO4: 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.
- CO5: This curriculum develops Research ability and process of Research Methodology in History

Course36171 (DSE- 3C) Applied History (Sem-VI)

After successfully completing this course, students will be able to:

- CO1: Students will be introduced to the information and importance of applied history.
- CO2: Student will learn about the Historical significance of Archaeology and Archives and opportunities in the field of Archaeology and Archives.
- CO3: Through this course, students will be informed about the opportunities in the field of Media, Museums.
- CO4: 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.

Course35172 (DSE- 4D) Maharashtra in the 19th Century (Sem-V)

After successfully completing this course, students will be able to:

- CO1: Student will develop the ability to analyse sources for 19th century Maharashtra History.
- CO2: Student will learn significance of Regional History and Socio- religious reformism foundation of the region.
- CO3: It will enhance their perception of 19th Century Maharashtra.
- CO4: Appreciate the skills of leadership and the Socio-religious System of the Maharashtra

Course36172 (DSE- 4D) Maharashtra in the 20th Century (Sem-VI)

After successfully completing this course, students will be able to:

- CO1: Student will develop the ability to analyses sources for 20th Century Maharashtra History.
- CO2: Student will learn significance of regional history and Socio- Religious Reformism foundation of the region.
- CO3: It will enhance their Perception of 20th Century Maharashtra.
- CO4: Appreciate the skills of leadership and the Socio-Religious System of the Maharashtra.

Course35174 (CC- 3C) Indian National Movement (1885-1947)(Sem-V)

After successfully completing this course, students will be able to:

- CO1: It will enable students to develop an overall understanding of Modern India.
CO2: It will increase the spirit of healthy Nationalism, Democratic Values and Secularism among the Students.
CO3: Students will understand various aspects of the Indian Independence Movement and the creation of Modern India.

Course36174 (CC- 4) India after Independence- (1947-1991) (Sem-VI)

After successfully completing this course, students will be able to:

- CO1: It will enable students to develop an overall understanding of the Contemporary India.
CO2: To increase the spirit of healthy Nationalism, Democratic Values and Secularism among the students.
CO3: Students will understand various aspects of India's domestic and foreign policies that shaped post-Independence India

Course35177 (SEC- 2C) Research Paper Writing (Sem-V)

After successfully completing this course, students will be able to:

- CO1: Students will be introduced to the information and importance of Historiography.
CO2: Students can study the interdisciplinary approach History.
CO3: This curriculum will help to develop Research ability and Process of Research Paper Writing in History

Course36177 (SEC- 2D) Archaeology. (Sem-VI)

After successfully completing this course, students will be able to:

- CO1: Students will learn to understand the definition, aims and scope of Archaeology so as to understand its applications in interpreting the human past.
CO2: They will be able to understand the nature of the archaeological record and the unique role of science in archaeology.
CO3: They will have an overall understanding of the Archaeology
-

M.A.History

ProgrammeOutcomes

After successfully completing M.A. History Programme students will be able to:

- PO1: Apply qualitative and quantitative research techniques to gather and analyzed data on social, cultural, and ecological problems.
- PO2: Apply clear written and oral communication skills to communicate the results of research.
- PO3: Demonstrate connections between everyday life at the local scale and the larger economic, social, and that network them into a global community.
- PO4: Evaluate cultural, social, and Historgraphic with a particular focus on space and place, critical theory, practical application, analysis and/or social justice.
- PO5: Think in spatial terms to explain what has occurred in the past as well as using Historgraphic principles to understand the present and plan for the future.
- PO6: Present completed research, including an explanation of methodology and scholarly discussion, both orally and in written form and, wherever possible, utilize Historgraphic tools and other visual formats.
- PO7: Demonstrate general understanding of how the Historical, human societies, and local and global economic systems are integral to the principles of sustainable development.
- PO8: Demonstrate acquisition of chart/map and Image reading skill.
- PO9: Apply concepts and Theories, Historical terms.
- PO10: Develop research questions and critically analyze both qualitative and quantitative data to answer those questions using various theoretical and methodological approaches in Historical Research.
- PO11: Read, interpret, and generate maps and other geographic representations as well as extract, analyze, and present information from a spatial perspective

ProgrammeSpecificOutcomes

After completing **M.A. History course students will have**

- PSO1: Knowledge of Historical terms, concepts and Theories.
- PSO2: Ability of explanation of correlation between Historical facts and processes.
- PSO3: Development of Scientific Method of Historical Research.
- PSO4: Understanding of Maratha Polity.
- PSO5: Ability to use Historical research methodologies and research projects

Course Outcomes

MA History Part I

Course- 12201: History: Theory and Method (SEM-I)

The student who successfully completes this course can able to:

CO1: Provide adequate conceptual base, bring better understanding of history and its forces, help interrogate existing paradigms and challenge the outdated, help in developing critique, help research in terms of formulating hypotheses and develop broad frames of interaction with other social sciences and attain certain level of Interdisciplinary approach.

Course12202: Evolution of Ideas and Institutions in Early India (SEM-I)

The student who successfully completes this course can able to-

CO1: Provide an understanding of the social, economic and institutional bases of early India. It is based on the premise that an understanding of early Indian history is crucial to understand Indian history as a whole.

Course12203: Maratha Polity (SEM-I)

After successfully completing this course, students will be able to:

CO1: Study the administrative system of the Marathas in an analytical way, to acquaint The student with the nature of Maratha Polity, to understand basic components of the Maratha administrative structure, to enable the student to understand the basic concepts of the Maratha polity.

Course12204: Social Background of Dalit Movement in Maharashtra (SEM-I)

The student who successfully completes this course can able to:

CO1: Emphasize the background of the Dalit movement which flourished in the twentieth century.
CO2: Highlights the earlier forms of protest from the ancient till the medieval period, which laid the foundations for social protest and dissent in the pre- Ambedkar period.

Course- 22201: Approaches to History (SEM-II)

The student who successfully completes this course can be:

CO1: Aware about the various approaches to the discipline of History. With its roots in Indian history, the paper provides a historical review of the salient approaches that have developed over the last few centuries.
CO2: Student will become aware of the idea that the same set of historical source materials can be interpreted in different ways depending upon the approach one takes in studying them.

Course22202: Ideas and Institutions in Medieval India (SEM-II)

The student who successfully completes this course can able to-

CO1: Examines the nature of medieval Indian society, economy, state formations, and the main religious currents of the time. It is seen as a continuation of the course

on ancient India.

CO2: Understand of the nature of society, and the problems of the challenge to that society, through colonialism, at a later stage.

Course22203: Socio-Economic History of the Marathas (SEM-II)

After successfully completing this course, students will be able to:

CO1: Study socio-economic history of the Marathas in an analytical way, to acquaint the student with the components of social structure and their functions, to understand the relationship between religion, caste, customs, traditions, class in 17th and 18th century Maratha Society, to enable the student to understand aspects of economic life, to trace the determinants of changes in social and economic life.

Course22204: Marathas in 17th and 18th Century: Power Politics (SEM-II)

The student who successfully completes this course can able to:

CO1: Study the role played by the Marathas in the context of India, the changing nature of Maratha State, to understand and analyse the Maratha expansionism and its significance in various spheres.

Course- 32201: Cultural History of Maharashtra (SEM-III)

The student who successfully completes this course can able to:

CO1: Situate and interpret the cultural manifestations across historical memory which has contributed to the creation of the geopolitical region of Maharashtra.

Course32202: Intellectual History of Modern World (SEM-III)

The student who successfully completes this course can able to:

CO1: Understand the concepts that are used in history, to acquaint the student with the intellectual activity that played an important role in shaping events; the transition from medieval to modern times.

Course32203: Economic History of Modern India (SEM-III)

The student who successfully completes this course can able to:

CO1: Acquaint with structural and conceptual changes in Indian economy after coming of the British, to make them aware of the exploitative nature of the British rule, to help them understand the process of internalization by Indians of new economic ideas, principles and practices

Course32204: East Asia: Japan (1853-2000) (SEM-III)

The student who successfully completes this course can able to:

CO1: Know Japanese history especially after the opening up of Japan; Japan's modernization and its impact; post World War II developments and Japan's role in world politics.

Course- 42201: Modern Maharashtra: A History of Ideas (SEM-IV)

The student who successfully completes this course can able to:

- CO1: Explore the ideas which have given Maharashtra its unique character. It also hopes to offer a specialized knowledge of the Intellectual History of Maharashtra based on a critical reading of the original textual sources.

Course42202: Debates in Indian Historiography (SEM-IV)

The student who successfully completes this course can able to:

- CO1: Know some of the issues that been debated by historians and to introduce some perspectives with reference to Indian History.

Course42203: World after World War II (1945-2000)(SEM-IV)

The student who successfully completes this course can able to:

- CO1: Acquaint with the post-World War II scenario and to enable them to understand contemporary world from the historical perspective.

Course42204: History of Modern India (1857-1971) (SEM-IV)

The student who successfully completes this course can able to:

- CO1: Enable the student to study the history of 'Modern India' from an analytical perspective.
- CO2: To make the student aware of the multi-dimensionality of Modern India; to highlight the ideas, institutions, forces and movements that contributed to the shaping of Indian modernity.
- CO3: To acquaint the student with various interpretative perspectives; to help them in articulating their own ideas and views leading to research orientation.

Rajgad Dnyanpeeths
Anantrao Thopte College, Bhore

DEPARTMENT OF MARATHI

B. A. (Marathi) Programme

Programme Outcomes:

- PO1: मराठी विषयाचे सखोल ज्ञान प्राप्त होईल व कौशल्ये आत्मसात होतील
- PO2: मराठी साहित्यातून विद्यार्थ्यांना जीवनाकडे पाहण्याचा सकारात्मक दृष्टिकोन मिळेल
- PO3: समाजाचे भाषिक सर्वेक्षण करून एक प्रकारे मराठीचे विद्यार्थी समाजाशी संवादी होतील
- PO4: मराठी साहित्य व संस्कृती यांचा मेळ घालून त्याविषयी समाज घटकांशी संवाद साधू शकतील
- PO5: मराठी भाषिक कौशल्ये आत्मसात केल्याने ते समाजातील घटकांशी प्रभावीपणे संवाद साधू शकतील
- PO6: मराठी साहित्यातून मिळालेल्या ज्ञानामुळे त्यांना त्यांच्या जबाबदारीची जाणीव होऊन समर्थ नागरिक म्हणून त्या ज्ञानाचा उपयोग करू शकतील
- PO7: आत्मसात केलेली व्यावहारिक भाषा विषयक कौशल्ये समूहामध्ये काम करताना प्रभावीपणे वापरू शकतील
- PO8: मराठी भाषेच्या सर्वकष ज्ञानामुळे साहित्य व संस्कृती याविषयीच्या संशोधनांमध्ये प्रभावीपणे काम करू शकतील
- PO9: मराठी साहित्यातून मांडलेले पर्यावरणाचे प्रश्न विद्यार्थी पर्यावरणाच्या रक्षणासाठी आणि ते टिकवण्यासाठी प्रयत्न करतील
- PO10: वेगवेगळ्या साहित्य प्रकाराचा अभ्यास करून त्यातून समाजाविषयी ज्ञान अवगत करू शकतील
- PO11: साहित्यातून आत्मसात केलेली नीतीतत्त्वे यांचा वैयक्तिक जीवन संघटन यामध्ये प्रभावीपणे वापर करू शकतील.

Programme specific Outcomes

- PSO1: साहित्याचे विश्लेषण करता येईल
- PSO2: साहित्याची समीक्षा करता येईल

सत्र पहिले

(11021) मराठी साहित्य : कथा आणि भाषिक कौशल्यविकास [CC-1A] :

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थी खालील गोष्टी करू शकतील

CO1: कथा या साहित्य प्रकाराची ओळख होईल.

CO2: विविध साहित्य प्रवाहांचा परिचय होईल.

CO3: भाषिक कौशल्य विकास होईल.

सत्र दुसरे

(12021) मराठी साहित्य : एकांकिका आणि भाषिक कौशल्यविकास [CC-1A] :

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थी खालील गोष्टी करू शकतील

CO1 : स्थूलपणे मराठी भाषा मराठी साहित्य आणि मराठी संस्कृती यांचा विद्यार्थ्यांना परिचय होऊन विद्यार्थ्यांना भारतीय संस्कृतीची ओळख होईल.

CO2 : विद्यार्थ्यांच्या वांग्मयीन अभिरुचीचा विकास होईल व त्याविषयी स्पष्टीकरण देता येईल.

CO3 : विद्यार्थ्यांमध्ये आस्वाद घेण्याची डोळस क्षमता वाढीस लागेल.

CO4 : व्यक्तिमत्व विकासामध्ये भाषेला अनन्यसाधारण महत्त्व आहे हे सांगू शकतील .

CO5 : भाषिक कौशल्ये आत्मसात करता येतील व त्याची महती त्यांना स्पष्ट करता येईल.

CO6 : विविध भाषिक कौशल्यांचा उपयोग व्यवहारामध्ये करता येईल साहित्याच्या अभ्यासामधून विद्यार्थ्यांना जीवन विषयक समाजाबाबत विश्लेषण करता येईल.

CO7 : विविध साहित्य प्रकारांचे विद्यार्थ्यांना विवेचन करता येईल.

CO8 : कथा व एकांकिका या साहित्य प्रकाराची संकल्पना स्पष्ट होईल.

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सत्र तिसरे

[23022] साहित्यविचार [DSE 1 B (3)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थी खालील गोष्टी करू शकतील.

CO1 : भारतीय आणि पाश्चिमात्य साहित्य विचारांची विद्यार्थ्यांना ओळख होईल.

CO2 : साहित्याच्या स्वरूपाविषयी विश्लेषण ते करू शकतील.

CO3 : साहित्याचे प्रयोजन निर्मिती प्रक्रिया, साहित्याची भाषा यांचा आढावा विद्यार्थी घेऊ शकतील.

[23023] भाषिक कौशल्यविकास आणि आधुनिक मराठी साहित्यप्रकार कादंबरी [CC 1 C (3)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : कादंबरी या साहित्य प्रकाराचे स्वरूप घटक प्रकार आणि वाटचाल समजेल.

CO2 : नेमलेल्या कादंबरीचे विश्लेषण करता येईल.

CO3 : भाषिक कौशल्ये विकसित होतील.

[23025] आधुनिक मराठी साहित्य : प्रकाशवाटा [DSE 1 A (3)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : आत्मचरित्र या साहित्य प्रकाराचे स्वरूप व संकल्पना स्पष्ट होतील.

CO2 : आत्मचरित्र वाङ्मय प्रकाराची प्रेरणा व वाटचाल स्पष्ट होईल.

CO3 : ललित गद्यातील साहित्य प्रकारांच्या तुलनेत आत्मचरित्राचे वेगळेपण समजेल.

सत्र चौथे

[24021] मध्ययुगीन मराठी साहित्य निवडक मध्ययुगीन गद्य पद्य [DSE 2 A (3)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : मध्ययुगीन गद्य पद्य साहित्यप्रकारांची विद्यार्थ्यांना ओळख होईल.

CO2 : नेमलेल्या अभ्यास पुस्तकातील मध्ययुगीन गद्य पद्याचे विश्लेषण करता येईल.

CO3 : मध्ययुगातील सामाजिक परिस्थितीचा परिचय होईल.

[24022] साहित्यसमीक्षा [DSE 2 B (3)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : साहित्य समीक्षेची संकल्पना स्वरूप यांचा परिचय होईल.

CO2 : साहित्य आणि समीक्षा यांचे परस्पर संबंध समजून घेता येतील.

CO3 : साहित्य प्रकारानुसार समीक्षेचे स्वरूप समजेल तसेच ग्रंथ परिचय, परीक्षण, समीक्षण यातला फरक समजेल.

[24023] भाषिक कौशल्यविकास आणि आधुनिक मराठी साहित्यप्रकार ललितगद्य [CC 1 D (3)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : ललित गद्य या साहित्य प्रकाराचे स्वरूप घटक प्रकार आणि वाटचाल समजेल.

CO2 : नेमलेल्या पाठ्यपुस्तकातील ललित गद्याचे आकलन होईल तसेच विश्लेषण करता येईल.

CO3 : भाषिक कौशल्ये विकसित होतील.

सत्र पहिले

[23025] प्रकाशन व्यवहार आणि संपादन [SEC 2A (2)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : प्रकाशन व्यवहार आणि संपादन यासाठी आवश्यक कौशल्यांचा परिचय होईल.

CO2 : ग्रंथ निर्मिती प्रक्रियेची माहिती होईल.

CO3 : मुद्रित शोधन प्रक्रियेचा परिचय होईल.

सत्र दुसरे

[24025] उपयोजित लेखन कौशल्य [SEC 2B (2)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : जाहिरात लेखनासाठी आवश्यक कौशल्यांचा परिचय होईल.

CO2 : विविध माध्यमांवर मुलाखत लेखनकौशल्यांचा परिचय होईल.

CO3 : विविध माध्यमांसाठी नोंद लेखनकौशल्यांचा परिचय होईल.

सत्र तिसरे

[23011] मराठी भाषिक संज्ञापन कौशल्ये [MIL 2 (2)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : प्रगत भाषिक कौशल्यांची क्षमता व प्रसार माध्यमांसाठी लेखन क्षमता विकसित होईल

CO2 : व्यक्तिमत्व विकास आणि भाषा यांच्यातील सहसंबंध स्पष्ट होईल

CO3 : लोकशाहीतील जीवन व्यवहार आणि प्रसार माध्यमे यांचे परस्पर संबंध स्पष्ट होतील.

सत्र चौथे

[24011] नव माध्यमे व समाजमाध्यमांसाठी मराठी [MIL 2 (2)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : संज्ञापनातील नव माध्यमे आणि समाज माध्यमांचे स्वरूप व स्थान स्पष्ट होईल.

CO2 : भाषा जीवन व्यवहार आणि नव माध्यमे समाज माध्यमांचे परस्पर संबंध स्पष्ट होतील.

CO3 : नवमाध्यमे आणि समाज माध्यमाविषयक साक्षरता निर्माण होईल तसेच त्यांचा योग्य वापर करता येईल.

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सत्र पाचवे

[35021] मध्ययुगीन मराठी वाङ्मयाचा स्थूल इतिहास प्रारंभ ते इ.स. १६०० [DSE 1C (3+1)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : वाङ्मयेतिहासाची संकल्पना, स्वरूप, प्रेरणा व प्रवृत्ती यांचे आकलन होईल.

CO2 : मध्ययुगीन कालखंडाची सामाजिक सांस्कृतिक पार्श्वभूमी लक्षात येईल.

CO3 : मराठी भाषा साहित्याची कालखंडानुसार इतिहासाचा परिचय होईल.

सत्र सहावे

[36021] मध्ययुगीन मराठी वाङ्मयाचा स्थूल इतिहास इ.स. १६०० ते इ.स. १८१७ [DSE 1D (3+1)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : शिवकाल व पेशवेकळातील वाङ्मयनिर्मितीचा परिचय होईल.

CO2 : पंडित आणि शाहिरांच्या वाङ्मयनिर्मितीचा परिचय होईल.

CO3 : बखर आणि गद्य वाङ्मयनिर्मितीचा परिचय होईल.

सत्र पाचवे

[35022] वर्णनात्मक भाषा विज्ञान भाग १ [DSE 2C (3+1)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : भाषास्वरूप वैशिष्ट्ये व कार्य विद्यार्थ्यांच्या लक्षात येईल.

CO2 : भाषा अभ्यासाची आवश्यकता लक्षात येईल.

CO3 : भाषा अभ्यासाच्या शाखा त्यांच्या विविध पद्धती यांचा परिचय होईल.

सत्र सहावे

[36022] वर्णनात्मक भाषा विज्ञान भाग २ [DSE 2D (3+1)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : रूपविन्यास आणि मराठीची रूप व्यवस्था लक्षात येईल.

CO2 : वाक्यविन्यास आणि वाक्य व्यवस्थेचा मराठी भाषेच्या संदर्भात परिचय होईल.

CO3 : अर्थविन्यास या संकल्पनेचा भाषा वैज्ञानिक अंगाने परिचय होईल.

सत्र पाचवे

[35023] भाषिक कौशल्य विकास आणि आधुनिक मराठी साहित्यप्रकार : प्रवास वर्णन [CC-1E (3)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : मुद्रित माध्यमांसाठी लेखन कौशल्य आत्मसात होतील

CO2 : प्रवास वर्णन या साहित्य प्रकाराचे स्वरूप प्रेरणा, प्रयोजन, वैशिष्ट्ये व वाटचाल यांचा परिचय होईल.

CO3 : नेमलेल्या प्रवास वर्णनाचे विश्लेषण करता येईल.

सत्र सहावे

[36023] भाषिक कौशल्य विकास आणि आधुनिक मराठी साहित्यप्रकार : कविता [CC-1F (3)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : मराठी साहित्य भाषिक कौशल्य विकास आणि शासन व्यवहार यांचा परिचय होईल.

CO2 : कविता या साहित्य प्रकाराचे स्वरूप वाटचाल प्रेरणा प्रवृत्ती वैशिष्ट्ये यांचा परिचय होईल.

CO3 : कविता या साहित्य प्रकारातील विविध अविष्कार व भाषारूपांचा परिचय होईल.

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सत्र पहिले

[117] भाषा साहित्य आणि कौशल्यविकास

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : व्यवहार क्षेत्रातील मराठी भाषेचे स्थान स्पष्ट होईल व त्यातील मराठीच्या प्रत्यक्ष वापराचा अभ्यास होईल.

CO2 : विविध क्षेत्रिय मराठी भाषेच्या वापराची कौशल्ये विकसित होतील.

CO3 : विविध क्षेत्रातील कर्तृत्ववान व्यक्तींच्या कार्याची व विचारांची ओळख होईल

सत्र दुसरे

[117] भाषा आणि कौशल्यविकास

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : विद्यार्थी विविध लेखन प्रकारांचा अभ्यास व प्रत्यक्ष लेखनाची कौशल्य वापरण्यास सक्षम होतील.

CO2 : विद्यार्थ्यांमध्ये नैतिक व्यावसायिक व वैचारिक मूल्यांची जोपासना होईल.

CO3 : विविध क्षेत्रिय मराठी भाषेच्या वापराची कौशल्ये त्यांच्यात विकसित होतील.

S.Y.BSc.

सत्र पहिले

उपयोजित मराठी [AECC - 2A]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : मराठी भाषा साहित्य आणि त्यांच्या परस्पर संबंधांची विद्यार्थ्यांमध्ये जाणीव होईल.

CO2 : मराठी भाषेचा परिभाषेसापेक्ष आणि शैलीसापेक्ष विकास विद्यार्थ्यांच्या लक्षात येईल.

CO3 : मराठी भाषेची उपयोजनात्मक कौशल्ये विकसित होतील.

सत्र दुसरे

मराठी साहित्य [AECC – 2B]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : विद्यार्थ्यांची साहित्य विषयक अभिरुची विकसित होईल.

CO2 : मराठी भाषा साहित्य आणि त्यांच्या परस्पर संबंधांची जाणीव विद्यार्थ्यांमध्ये होईल.

CO3 : विज्ञान साहित्य विषयक आकलन क्षमता विकसित होईल.

M. A. (Marathi) Programme

Programme Outcomes:

- PO1: मराठी भाषेचा वापर करण्याची कौशल्य आत्मसात करतील.
- PO2: सर्जनशील लेखन करण्यासाठी मराठी भाषेची क्षमता विकसित होईल.
- PO3: उत्कृष्ट संज्ञापन कौशल्य आत्मसात करता येतील आणि मराठी भाषेचा योग्य प्रकारे वापर करता येईल.
- PO4: विविध प्रसार माध्यमांमध्ये मराठीचा वापर कौशल्याने करू शकतील.
- PO5: कार्यालयीन मराठीचा वापर त्यांना करता येईल मराठी लोकसंस्कृतीची माहिती ते सांगू शकतील.
- PO6: मराठी साहित्यातील विविध प्रवाहंचा त्यांना परिचय होईल.
- PO7: शुद्धलेखन व्याकरण या संकल्पना स्पष्ट होतील.
- PO8: समीक्षा आणि संशोधन व्यवहार ज्ञान त्यांना होईल.
- PO9: लेखकाचा अभ्यास करण्याची क्षमता निर्माण होईल.

Programme specific Outcomes

- PSO1 : साहित्य संशोधनामध्ये रुची निर्माण होईल.
- PSO2 :संशोधनाची निरनिराळी अंगे तसेच विविध पद्धतींचा अभ्यास करता येईल.

Course Outcomes

M. A. भाग १

सत्र १ व २

[10401] भाषाव्यवहार आणि भाषिक कौशल्ये भाग १ [CC-1]

[20401] भाषाव्यवहार आणि भाषिक कौशल्ये भाग २ [CC-1]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

- CO1 : विद्यार्थ्यांना विविध भाषिक कौशल्यांवर विवेचन करता येईल.
- CO2 : व्यवहारातील मराठी भाषेच्या वापरावरती त्यांना चर्चा करता येईल.
- CO3 : प्रत्यक्ष व्यवहारात त्यांना मराठी भाषेचा कौशल्याने वापर करता येईल.
- CO4 : पारिभाषिक संज्ञांचे विश्लेषण करता येईल.
- CO5 : शुद्धलेखन आणि मुद्रित शोधन यावर चर्चा करता येईल.
- CO6 : मराठी भाषेच्या उपयोजनावर त्यांना भाष्य करता येईल

सत्र १ व २

[10402] मराठी साहित्याचा इतिहास [CC-2]

[20402]] मराठी साहित्याचा इतिहास [CC-2]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

- CO1 : वाङ्मयाच्या इतिहासाची ओळख विद्यार्थ्यांना होईल.
- CO2 : वाङ्मयाच्या इतिहासातील प्राचीन मध्ययुगीन अर्वाचीन या संकल्पनांचे विवेचन करता येईल.
- CO3 : वाङ्मयाचा आस्वाद घेऊन त्याचे वर्गीकरण ते करू शकतील.
- CO4 : वाङ्मयाच्या अभ्यासामुळे वाङ्मयामध्ये झालेले विविध स्थित्यंतरे ते विशद करू शकतील..
- CO5 : इतिहास लेखनाच्या प्रेरणांवरती ते स्पष्टीकरण देऊ शकतील.
- CO6 : परकीय भाषा आणि भाष्य यातील स्नेहसंबंधांचे विवेचन करू शकतील.
- CO7 : वाङ्मयाच्या अभ्यासाच्या नव्या दिशांवर ते चर्चा करू शकतील.
- CO8 : विशिष्ट कालखंडातील साहित्य निर्मितीच्या प्रेरणा व प्रवृत्ती लक्षात घेऊन साहित्याचे नेमके आकलन त्यांना होईल.

सत्र १ व २

[10403] ऐतिहासिक भाषाविज्ञान [CC-3]

[20403] समाज भाषाविज्ञान [CC-7]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : भाषेचे स्वरूप भाषेचे कार्य आणि भाषा अभ्यासाच्या विविध पद्धतींचा त्यांना परिचय होईल.

CO2 : भाषा उद्गम व विस्तार यांचा त्यांना परिचय होईल.

CO3 : भाषाकुल संकल्पना व स्वरूप स्पष्ट होईल

CO4 : समाज भाषाविज्ञानाचे स्वरूप व भूमिका विद्यार्थ्यांना स्पष्ट होईल

CO5 : भाषा उपयोजनातील वैविध्य तसेच भाषा आणि संस्कृती परस्पर संबंध यांचा परिचय विद्यार्थ्यांना होईल.

CO6 : विविध नवव्यवस्था, बदलती भाषा रूपे यांचा परिचय विद्यार्थ्यांना होईल.

सत्र १ व २

[10404] ग्रामीण साहित्य [CBOP - 4]

[20404] दलित साहित्य [CBOP - 8]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : स्वातंत्र्यप्राप्तीनंतरच्या कालखंडात ग्रामीण साहित्याच्या निर्मितीची कारणपरंपरा विद्यार्थ्यांना समजेल.

CO2 : ग्रामीण साहित्याचे स्वरूप व कार्य यांची चिकित्सा विद्यार्थी करू शकतील

CO3 : ग्रामीण साहित्याच्या विविध वाङ्मयप्रकारांचा विकास कसा होत गेला, ग्रामीण साहित्याचे योगदान, त्याच्या विकासाची गती, दिशा याची मीमांसा विद्यार्थ्यांना करता येईल.

CO4 : स्वातंत्र्यप्राप्तीनंतरच्या कालखंडात दलित साहित्य निर्मितीची कारणे विद्यार्थ्यांना समजतील

CO5 : दलित साहित्यातून व्यक्त होणाऱ्या वेदना विद्रोह व नकार यांचे स्वरूप विद्यार्थ्यांना कळेल.

CO6 : दलित साहित्याने निर्माण केलेल्या विविध साहित्य प्रकारांच्या विकासाचे मूल्यमापन विद्यार्थी करू शकतील.

सत्र ३ व ४

[30401] प्रसार माध्यमांसाठी लेखन कौशल्ये भाग १ [CC – 9 (4)]

[40401] प्रसार माध्यमांसाठी लेखन कौशल्ये भाग २ [CC – 13 (4)]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : प्रसार माध्यमांकरीता लेखनकौशल्ये आत्मसात होतील.

CO2 : प्रसारमाध्यमांचे समाजातील महत्त्व विशद करू शकतील.

CO3 : दृकश्राव्य नवमाध्यमांसाठी लेखन करण्याची क्षमता त्यांच्यात विकसित होईल.

CO4 : माहितीपटासाठी लेखनाचा परिचय त्यांना होईल.

CO5 : चित्रपटासाठीचे लेखनाचा परिचय त्यांना होईल.

CO6 : लिखित व दृकश्राव्य स्वरूपाच्या नवसमाज माध्यमांसाठीच्या लेखनाचा परिचय त्यांना होईल.

सत्र ३ व ४

[30402] साहित्यसमीक्षा [CC – 10 (4)]

[40402] साहित्य संशोधन [CC – 14]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : विद्यार्थ्यांच्या साहित्य समीक्षा व्यवहाराच्या क्षमता विकसित होतील.

CO2 : समीक्षेची संकल्पना ज्ञात होईल.

CO3 : समीक्षा व्यवहारातील मूल्य संकल्पनांचा परिचय होईल.

CO4 : विविध समीक्षा पद्धतीमागील विचारव्यूह, दृष्टी ज्ञात होईल.

CO5 : संशोधनाची संकल्पना प्रयोजन आणि विविध संशोधन पद्धती ज्ञात होतील.

CO6 : वाङ्मयीन संशोधनाच्या विविध अभ्यासक्षेत्रांचा परिचय होईल.

CO7 : अंतर्विद्याक्षेत्रिय संशोधनाचे स्वरूप आणि महत्त्व लक्षात येईल.

CO8 : विद्यार्थ्यांची संशोधन करण्याची दृष्टी व क्षमता विकसित होईल.

सत्र ३ व ४

[30403] नेमलेल्या अर्वाचीन साहित्यकृतींचा अभ्यास - भाग १ [CC – 11]

[40404] नेमलेल्या अर्वाचीन साहित्यकृतींचा अभ्यास - भाग २ [CC – 15]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : अर्वाचीन कालखंडातील साहित्यप्रकार संकल्पना यांचे स्वरूप लक्षात येईल.

CO2 : साहित्यकृतींची वैशिष्ट्ये लक्षात येतील.

CO3 : साहित्यकृतीतील वाङ्मयीन मूल्ये आणि जीवनमूल्ये जाणून घेऊन अर्वाचीन साहित्य प्रकारांची वैशिष्ट्ये लक्षात येतील.

CO4 : नेमलेल्या अर्वाचीन साहित्यकृतींचे स्वरूप लक्षात येईल.

CO5 : साहित्य कृतींची वैशिष्ट्य लक्षात येतील.

CO6 : कालखंड आणि साहित्य कृतींच्या निर्मितीचा अनुबंध विद्यार्थी शोधू शकतील.

CO7 : अर्वाचीन साहित्य प्रकारांची वैशिष्ट्ये त्यांच्या लक्षात येतील.

सत्र ३ व ४

[30405] लोकसाहित्याची मूलतत्त्वे व मराठी लोकसाहित्य - भाग १ [CBOP – 12]

[40405] लोकसाहित्याची मूलतत्त्वे व मराठी लोकसाहित्य - भाग २ [CBOP – 16]

हा अभ्यासक्रम यशस्वीरित्या पूर्ण केल्यानंतर विद्यार्थ्यांना पुढील गोष्टी करता येतील.

CO1 : लोक साहित्याच्या मूलतत्त्वांची ओळख विद्यार्थ्यांना होईल

CO2 : मराठीतील लोकसाहित्याच्या संकलन संशोधन व मूल्यनास चालना मिळेल.

CO3 : विद्यार्थ्यांना लोकसाहित्याचे स्वरूप व्यापकता व सर्व सामावेशकता लक्षात येईल.

CO4 : लोकसाहित्यातील सामाजिक धार्मिक सांस्कृतिक जाणीवा स्पष्ट होतील.

CO5 : लोकसाहित्याच्या अभ्यासक क्षेत्राची व्याप्ती लक्षात येईल.

CO6 : लोकसाहित्याचे कलात्मक सौंदर्य व कलाविष्काराचे स्वरूप ज्ञात होईल तसेच लोकसाहित्याच्या अभ्यासकांचे लोकसाहित्यातील योगदान लक्षात येईल.

Rajgad Dnyanpeeth's

Anantrao Thopte College, Bhor

Department of Mathematics

After completing B.Sc (Mathematics) Programme students will be able to:

PO1: Explain the importance of mathematics and investigate the real-world problems and learn to how to apply mathematical ideas and models to those problems.

PO2: Reason mathematically and apply rigorous, analytic, highly numerate approach to analyze, execute tasks and solve problems in daily life and at work.

PO3: Recognize the power of abstraction and generalization, and to carry out investigative mathematical work with independent judgment.

PO4: Investigate and apply mathematical problems and solutions in a variety of contexts related to science, technology, business and industry, and illustrate these solutions using symbolic, numeric, or graphical methods

PO5: Identify the type and solve abstract mathematical problems and give geometrical interpretation of various concepts.

PO6: Recognize connections between different subjects in mathematics.

PO7: Develop an understanding of the underlying unifying structures of mathematics (sets, relations and functions, logical structure) and the relationships among them.

PO8: Conduct self-evaluation, and continuously enrich them through lifelong learning.

PO9: Communicate and interact effectively with different audiences and collaborate intellectually and creatively in diverse contexts, while emphasizing the importance of clarity and precision in communication and reasoning.

PO10: Formulate and analyze mathematical problems, precisely define the key terms, and draw clear and reasonable conclusions.

PSO1: Help the students to enhance their knowledge in soft skills and Computing skills.

PSO2: Enable the students to equip knowledge in various concepts involved in functions of single variable.

PSO3: Enable the students to equip knowledge in various concepts involved in Calculus and geometry.

F.Y. B Sc (Mathematics)

Course MT101: Algebra and Geometry (SEM - I)

After successfully completing this course, students will be able to:

CO1: Define the terms gcd, lcm, relation, equivalence relation, matrices, polynomial.

CO2: Describe the methods of solving Homogenous and Non-Homogenous system of linear equations and its solutions by Gauss elimination and Gauss Jordan method

CO3: Explain algebraic properties of integers, finding gcd by Euclidean Algorithm, supremum, infimum, solving problems using first principle of Mathematical induction and strong induction.

CO4: Solve the system of equations using matrices, matrices by using Cayley Hamilton theorem, addition and multiplication and finding gcd of two polynomials

CO5: Calculate gcd of numbers, remainder using congruence properties

CO6: Use factor theorem, Remainder theorem to calculate remainder when one polynomial divides another polynomial.

Course MT101: Algebra and Geometry (SEM - II)

After successfully completing this course, students will be able to:

CO1: Define Conic, Translation, Rotation, Centre, dcs, drs, etc. by using basic concepts.

CO2: Explain the concepts of Geometry by using basic definitions.

CO3: Calculate shortest distance between skew lines, radius, centre of sphere and angle between planes and lines, cylinder, cone by using some formulae.

CO4: Reduce the general equation of conic to its standard form by using reduction formulae.

CO5: Determine the condition of tangency for the Sphere by using basic formulae.

CO6: Give diagrammatic representations of various concepts by sketching diagrams.

Course MT102: Calculus and Differential Equation (SEM - I)

After successfully completing this course, students will be able to:

- CO1: Recall definitions of the topics in calculus
- CO2: Recognize the definitions and concepts giving examples of calculus
- CO3: Describe the concepts and solve simple examples of single variable functions
- CO4: Solve tricky examples of of single variable functions
- CO5: Illustrate concepts in calculus of a single variable
- CO6: Classify and apply concepts of a single variable calculus

Course MT102: Calculus and Differential Equation (SEM - II)

After successfully completing this course, students will be able to:

- CO1: Define the terms differential equation, order, degree, Bernoulli's equation, self-orthogonal
- CO2: Describe the methods of solving integration using partial fraction, substitution of trigonometric, logarithm, exponential functions and differential equations problems using variable separable form, exact equations, homogeneous, non-homogeneous, etc.
- CO3: Convert non exact differential equation to exact differential equation by finding integrating factor
- CO4: Solve differential equation of first order and higher degree using method of solvable for p , solvable for x , solvable for y and Lagrange's equation and Clairaut's equation
- CO5: Explain reduction formula for trigonometric equation like $\cos n x$
- CO6: Use self-orthogonal method to find orthogonal trajectory for a curve of family.

Course MT103: Mathematics Practical

CO1: Calculate gcd of two numbers using Euclidean algorithm and perform reverse process., radius and centre of sphere using formula

CO2: Solve system of linear equations using gauss elimination and gauss Jordan method

CO3: Solve polynomial to find roots by using synthetic division.

CO4: Calculate remainder using congruence properties.

CO5: Calculate limit using definition derivative, integration using partial fraction, substitution of trigonometric, logarithm, exponential functions, differential equations variable separable form, exact equations, homogenous, non-homogenous, etc.

CO6: Determine the solution of first order and higher degree differential equation using method of solvable for p, solvable for x, solvable for y and lagranges equation and Cairauts equation

S. Y. B Sc (Mathematics)

Course MT211: Multivariable Calculus (Sem - I)

After successfully completing this course, students will be able to:

CO1: Recall the definitions of the topics in multivariable calculus.

CO2: Recognize all the definitions and concepts by giving examples of multivariable calculus.

CO3: Describe the concepts and solve simple examples of multivariable calculus by using basic definitions.

CO4: Solve tricky examples of multivariable calculus by using correct methods

CO5: Illustrate theorems in multivariable calculus by using basic concepts and definitions.

CO6: Classify and apply concepts for solving problems in multivariable calculus by using correct method.

CO7: Analyze and draw diagrams for solving examples of multivariable calculus.

CO8: Choose appropriate method for solving examples in multiple integrals by using double or triple integrals.

Course MT212: Discrete Mathematics (Sem - I)

After successfully completing this course, students will be able to:

CO1: Recall basics of logics, permutations (arrangements), combinations(selections)

CO2: Define concepts as Proposition, Quantifier, its types universal and existential, Principle of Addition, Principle of multiplication

CO3: Describe the methods such as direct method and indirect method to check validity of Argument

CO4: Explain the truth values of Nested quantifier, Validity of arguments and provide counter examples where necessary

CO5: Apply the formula of Advanced counting technique to solve the problems

CO6: Solve the sums based on counting like arrangement and selections using repetition

and non-repetition

CO7: Classify the problems of arrangements and selections with repetitions and without repetitions

CO8: Explain the counting arrangements using Venn diagrams

Course MT213 : Practical based on MT211, MT212

CO1: Solve propositions by truth tables

CO2: Calculate limit continuity and differentiability of function in two variables

CO3: Discuss the validity of a proposition using direct and indirect method

CO4: Discuss the maxima and minima of functions

CO5: Solve examples such as finding intersection and union of two or more sets using inclusion exclusion principle

CO6: Calculate area and volume for function using double and triple integration

CO7: Classify the problems of arrangements and selections with repetitions and without repetitions

CO8: Draw level curves for various functions using graph such as $f(x,y) = x^2 + y^2$

Course MT221: Linear Algebra (Sem – II)

After successfully completing this course, students will be able to:

CO1: Recall the algebraic properties, commutative, associative laws etc of real numbers.

CO2: Define concepts as Vector Spaces, subspace, span, kernel, linearly dependent etc.

CO3: Describe spanning of vector space, inner product of vectors, linear transformation for set of vectors

CO4: Give counter examples for set not satisfying properties of subspace

CO5: Solve examples to find inverse of a linear transformation and check whether linear transformation is bijective or not.

CO6: Apply dimension theorem to find nullity and dimension of vector space.

CO7: Calculate coordinate vector, orthogonality, orthonormality, norm of vectors using formulas.

CO8: Explain Gram Schmidt process to convert basis to orthonormal basis

Course MT222: Numerical techniques (Sem – II)

After successfully completing this course, students will be able to:

- CO1: Recall definitions and formulae of various numerical methods for finding roots of the equations, interpolation,
- CO2: Define concepts as Aitken & #39;s D process
- CO3: Describe methods of solving algebraic and non-algebraic equations
- CO4: Give original examples for concepts in numerical methods
- CO5: Solve the problems in Numerical methods
- CO6: Apply theorem to find numerical solution
- CO7: Calculate numerical integration
- CO8: Explain concepts of numerical methods and evaluate problems

Course MT223 (Sem – II) : Practical based on MT221, MT222

After successfully completing this course, students will be able to:

- CO1: List solutions of algebraic and transcendental equations
- CO2: Discuss linear independence of a set
- CO3: Solve examples by using interpolation formula
- CO4: Solve examples of finding rank, nullity using dimension theorem
- CO5: Solve the problems in Numerical methods
- CO6: Solve differential equations using Euler's method and Runge Kutta method
- CO7: Calculate numerical integration
- CO8: Calculate inner product, norm.

Rajgad Dnyanpeeths
Anantrao Thopte College, Bhore

DEPARTMENT OF PHYSICS

B. Sc. Physics

Goals :

The Department has formulated three broad educational goals for the undergraduate degree programs:

Physics knowledge: To provide students with the basic foundation in physics and Nano technology, the interplay of theory and experiment, and to motivate scientific enthusiasm and curiosity and the joy of learning.

Problem solving skills: To provide students with the tools needed to analyse problems, apply mathematical formalism and experimentation, and synthesize ideas.

Employment and technical skills: To provide the students with technical skills necessary for successful careers in physics and related or alternative careers for which a physics foundation can be very useful. These include mathematics, computers, electronics and devices, and communication skills (oral and written).

Programme Outcomes :

Knowledge outcome:

After completing B.Sc. Physics Programme students will be able to:

PO1: Transfer and apply the acquired fundamental knowledge of physics, including basic concepts and principles of 1) classical mechanics, electrodynamics, quantum mechanics, Statistical Mechanics and thermodynamics; (2) mathematical (analytic and numerical) methods and experimental methods for physics to study different branches of physics

PO2: Demonstrate the ability to translate a physical description to a mathematical equation, and conversely, explain the physical meaning of the mathematics, represent key aspects of physics through graphs and diagrams, and use geometric arguments in problem-solving.

Skills Outcomes

Professional Skills

After completing B.Sc. Physics Programme students will be able to:

PO3: Apply and demonstrate knowledge of concepts of physics, to analyze a variety of physical phenomena

PO4: Demonstrate the learned laboratory skills, enabling them to take measurements in a physics laboratory and analyse the measurements to draw valid conclusions

PO5: Capable of oral and written scientific communication, and will prove that they can think critically and work independently.

PO6: Communicate effectively using graphical techniques, reports and presentations within a scientific environment.

PO7: Use and apply professional software for scientific data analysis and presentation

PO8: Respond effectively to unfamiliar problems in scientific contexts

PO9: Plan, execute and report the results of a complex extended experiment or investigation, using appropriate methods to analyze data and to evaluate the level of its uncertainty

PO10: Integrate and apply these skills to study different branches of physics.

Generic Competencies

PO11: Work comfortably with numbers and analysing an issue quantitatively, acquire knowledge effectively by self-study and work independently, present information in a clear, concise and logical manner and apply appropriate analytical and approximation methods.

Attitude/Value Outcomes

After completing B.Sc. Physics Programme students should have developed some positive attitudes and will have:

PO12: Willingness to take up responsibility in study and work. Confidence in his/her capabilities. Motivation for learning and experimentation

Program Specific Outcomes

After completing B. Sc. Physics, students will be able to

PSO1: Demonstrate understanding of principles and theories of physics. These include: Newtonian Mechanics, thermodynamics, atomic and Molecular physics, electrodynamics, electronics, optics, nuclear physics, quantum mechanics;

PSO2: Apply vector algebra, differential and integral calculus as well as graphical methods to solve physics problems;

PSO3: Demonstrate ability to apply knowledge learned in classroom to set and perform simple laboratory experiments;

PSO4: solve physics problems using the appropriate methods in mathematical, theoretical and computational physics

Course Outcomes :

Revised syllabus for **F.Y.B.Sc. (Physics)** (CBCS Pattern-2019-20)

To be implemented from Academic Year 2019-20

Course: PHY- 111: Mechanics and Properties of Matter

After successfully completing this course, the student will be able to:

CO1: Demonstrate an intermediate knowledge of Newton's Laws and the equations of motion

CO2: Analyse the forces on the object and apply them in calculations of the motion of simple systems using the free body diagrams

CO3: Determine whether using conservation of energy or conservation of momentum would be more appropriate for solving a dynamics problem

CO4: Apply the concepts of elasticity to real world problems.

CO5: List fundamental forces in nature, applications and factors affecting surface tension.

CO6: Define and conceptualize different laws of fluid mechanics and related quantities like steady, turbulent flow and concept of Reynolds number

CO7: Demonstrate different applications of Bernoulli's theorem, laws of elasticity, surface tension.

Course: Phy-112: Physics principles & applications.

After successfully completing this course, the student will be able to:

CO1: Define absorption, spontaneous emission and stimulated emission process and describe Laser action describe different atomic models in order to understand atomic structure

CO2: Classify different types of bonding & their properties.

CO3: Draw electromagnetic spectrum showing different regions and analyze vibrational & rotational spectra of diatomic molecule.

CO4: Study the properties of Laser and its applications.

CO5: Quote essential principles of operation of radar system and develop the radar for any given frequency.

CO6: Describe principle and construction of solar cell & to calculate efficiency and fill factor of solar cell.

Course: PHY-121:Heat and Thermodynamics

After successfully completing this course, the student will be able to:

CO1: Define laws of thermodynamics, entropy, thermodynamic processes etc.

CO2: Describe Andrew's experiment, Amagat's experiment, Carnot engine, concept of entropy.

CO3: Derive expression for efficiency of heat engine (Otto cycle, Diesel cycle, Carnot cycle), latent heat equation, adiabatic relations for perfect gas, work done during isothermal and adiabatic change.

CO4: Determine critical constants using Vander Waal's gas equation, Reduced equation of state

CO5: Compare reversible and irreversible processes, adiabatic and isothermal process,

CO6: Illustrate that work is a path dependent function using PV diagram and to solve entropy for reversible and irreversible process.

CO7: Apply first law of thermodynamics to solve problems.

CO8: Categorize thermometers and state its applications

Course: PHY-122: Electromagnetics

After successfully completing this course, the student will be able to:

CO1: Define the basic terms such as electric field, electric potential, magnetic intensity, magnetic induction, magnetic susceptibility and electric and magnetic flux.

CO2: State and conceptualize basic laws in electromagnetic.

CO3: Explain the superposition principle, gauss's law in dielectrics and relation between three electric vectors.

CO4: Solve numerical problems using Coulombs Law, Gauss's law, Biot-Savart's law, Ampere circuital law and principle of superposition

CO5: Determine the electric field and potential due to an electric dipole and different types of charge distribution.

CO6: Determine magnetic induction due to various current distributions

CO7: Derive the relation between three magnetic vectors and compare different types of magnetic material.

CO8: Describe soft and hard magnets on the basis of hysteresis loop.

Course: PHY-113 and PHY-123:Physics Practical

After successfully completing this course, the student will be able to:

CO1: Demonstrate an ability to collect data through observation and/or

CO2: Acquire technical and manipulative skills in using laboratory equipment, tools and materials

CO3: Experimentation and interpreting data.

CO4: Demonstrate an understanding of laboratory procedures including safety, and scientific methods.

CO5: Demonstrate a deeper understanding of abstract concepts and theories gained by experiencing and visualizing them as authentic phenomena.

CO6: Acquire the complementary skills of collaborative learning and teamwork in laboratory settings.

Revised syllabus for S.Y.B.Sc. (Physics) (CBCS Pattern-2020-21)

To be implemented from Academic Year 2020-21

PH-211: Mathematical Methods in Physics I

After successful completion of the course the student will be able to:

- CO1: define the basic operations in complex numbers;
- CO2: explain graphical representation of complex numbers and calculate roots of complex numbers;
- CO3: solve partial differential equations in Physics;
- CO4: discuss vector algebra required in Physics;
- CO5: define and calculate the gradient, divergence and curl of a field;
- CO6: define order, degree and homogeneity of ordinary differential equation;
- CO7: explain singular points of ordinary differential equation;
- CO8: develop problem-solving skills of identifying strategies to solve unfamiliar problem

PH-212: Electronics I

After successful completion of the course the student will be able to:

- CO1: define various laws, theorems and basic terms in electronics;
- CO2: calculate power, voltage or current across or through the particular component of a given circuit using circuit theorems; and able to design a circuit for transistor biasing, rectifier;
- CO3: describe construction and working of transistor and its applications in current and voltage amplification using different configurations;
- CO4: describe DC load line and bias point. List, explain, and design and analyze the different biasing circuits;
- CO5: explain real and ideal characteristics of operational amplifier and calculate gain in different modes;
- CO6: describe different applications of operational amplifier;
- CO7: design rectifier circuits, unregulated and regulated power supply;
- CO8: illustrate data from one number system to another and apply Boolean algebra to design logic circuits.

PHY-221: Oscillations, Waves and Sound

After successful completion of the course the student will be able to:

- CO1: define periodic and oscillatory motion;
- CO2: setup and solve differential equations of motion for simple harmonic, damped, and forced oscillators;
- CO3: describe oscillatory motion with graphs and equations, and use these descriptions to solve problems of oscillatory motion;
- CO4: discuss phenomenon of resonance and apply in different applications;
- CO5: set and solve differential equation for wave motion for longitudinal and transverse waves;
- CO6: calculate the phase velocity, energy and intensity of simple harmonic waves;
- CO7: discuss the Doppler effect, and predict in qualitative terms the frequency change that will occur for relative motion between source and observer or listener;
- CO8: Explain in qualitative terms how frequency, amplitude, and wave shape affect the pitch, intensity, and quality of tones produced by musical instruments.

Course: PHY- 222: Optics

After successful completion of the course the student will be able to:

- CO1: Describe the geometrical formation of images by thin lenses, lens equation and lens makers formula using fundamental laws of geometrical optics.
- CO2: Use mathematical analysis to calculate properties of image, formed by combination of lenses and applies theory of optics to calculate the cardinal points of an optical system and design optical devices
- CO3: Describe optical aberrations produced in image by lenses and methods of their removal.
- CO4: Describe the construction and operation of optical devices, including, eyepieces, compound microscope, grating, polarisers etc.
- CO5: Use mathematical analysis to find bright and dark fringes in an interference pattern of thin and wedge-shaped film and find a wavelength of light using newton's rings
- CO6: Interpret a diffraction pattern to determine resolution of an optical system and grating
- CO7: Demonstrate an ability to solve problems using 'paraxial' optics-based formulae, numerical calculations and graphical drawings.
- CO8: Geometrical determination of polarization of light and concept and determine a polarisation state of light by interpreting polariser

PHY-213 and PHY-223: PRACTICAL COURSE

After completing this practical course student will be able to

- CO1: Use various instruments and equipment.
 - CO2: design experiments to test a hypothesis and/or determine the value of an unknown quantity.
 - CO3: Describe the methodology of science and the relationship between observation and theory.
 - CO4: Set up experimental equipment to implement an experimental approach.
 - CO5: Analyse data, plot appropriate graphs and reach conclusions from your data analysis.
 - CO6: Work in a group to plan, implement and report on a project/experiment.
 - CO7: Keep a well-maintained and instructive laboratory logbook.
 - CO8: Express their knowledge and ideas through oral and written language.
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Revised syllabus for T.Y.B.Sc. (Physics) (CBCS Pattern-2021-22)

To be implemented from Academic Year 2021-22

PHY-351: Mathematical methods in physics II

After successful completion of the course the student will be able to:

- CO 1: Define and generate a general equation for gradient, divergence, curl & Laplacian in an orthogonal curvilinear coordinate system & their applications in physics.
- CO 2: Interpret relative motion, Galilean & Lorentz transformation equations.
- CO 3: Define proper time, Minkowski space, Time dilation, length contraction
- CO 4: Describe Michelson Morley experiment & its negative result.
- CO 5: Convert commonly occurring partial differential equations in physics into ODE's
- CO 6: Illustrate the problems on Frobenius method of series solution and to differentiate point of expansion of given differential equations.
- CO 7: Evaluate & plot Legendre polynomials, Hermite polynomials, Bessel function of first kind.
- CO 8: List the most important special functions in physics and to solve different properties related to special functions.

PHY-352: Electrodynamics

After successful completion of the course the student will be able to:

- CO1: Define the Biot-savart law, Amperes law, Coulombs law, Electric field, Electric susceptibility, Magnetic field & Faradays law.
- CO2: Explain method of electrical images, equation of continuity, Magnetic vector potential, B.H curve, Maxwell's equation & wave equations.
- CO3: Solve numerical problem on Coulombs force, magnetic induction, magnetic permeability and induced voltage, magnitude of electric & magnetic vectors.
- CO4: Determine work done by charges, total charge, force on the wire in different symmetry.
- CO5: Summarize pointing vector, polarization, reflection & refraction.
- CO6: Apply Biot Savart law in different symmetry problem.
- CO7: List the applications of Amperes law, Biot Savart law, Poynting theorem.
- CO8: Elaborate magnetic properties of the material.

PHY-353: Classical Mechanics:

After successfully completing this course, the student will be able to:

- CO1: Solve advanced problems involving the dynamic motion of classical mechanical systems with an intermediate knowledge of Newton's laws of motion
- CO2: Apply the concept of centre of mass and mechanics of system of particles and conservation of energy, linear and angular momentum to solve dynamics problems
- CO3: Demonstrate an intermediate knowledge of central-force motion and the concept of converting two body problems to single body problem and apply advanced methods to complex central-force motion problems.
- CO4: Demonstrate an intermediate knowledge of concept of laboratory frame and centre of mass frame and their use to calculate results of scattering experiments.
- CO5: Apply the concept scattering to get important information regarding the nature of interaction between atomic and subatomic particles through experiments
- CO6: Derive Lagrange and Hamilton's equations, and represent the equations of motion for simple mechanical systems such as: the Atwood's machine, Simple pendulum using these formulations of classical mechanics.
- CO7: Acquire working knowledge of the methods of Hamiltonian Dynamics and compute the Hamilton equations of motion for mechanical systems

CO8: Use calculus of variations to find the Euler-Lagrange equations and canonical transformations to find the constants of motion according to the Hamilton Jacobi theory.

CO9: Use Poisson brackets to find derivatives in phase space.

PHY-354: Atomic and Molecular Physics

After successful completion of the course the student will be able to:

- CO1: Derive the formulae for total energy of an atom so that energy level diagram can be drawn and also able to obtain the expression for spin orbit interaction energy.
- CO2: State laws, postulates in atomic and molecular Physics and able to compare various models of atomic structure.
- CO3: Calculate quantum state of electrons in an atom, spectral notation and electronic configuration of atom.
- CO4: Obtain formulae for Zeeman shift, wavelength of emitted X-ray s, Raman shift , rotational and vibrational energy for diatomic molecule and apply it.
- CO5: Explain origin of line spectra and able to compare continuous spectra, characteristic spectra and can differentiate between rotational, vibrational and electronic spectra.
- CO6: Explain application of Duane and Hunt's rule, Moseley's law and its importance, applications of X-rays, Raman effect and Auger effect.
- CO7: Draw and explain X-ray spectra, spectrum with and without magnetic field (Zeeman effect), Raman spectra and molecular spectra using quantum treatment
- CO8: Explain experimental arrangement to produce X-ray, to observe Raman effect and Zeeman effect.

PHY-355: Computational Physics

After successful completion of the course the student will be able to:

- CO1: define types of programming languages and their uses;
- CO2: gain basic competency with a widely used C-language for both general and scientific programming;
- CO3: define operators and expression in C-programming and navigate commands;
- CO4: explain control statements and loops as well as capable of writing C-program to solve problems;
- CO5: describe arrays and pointers and apply them in C program;
- CO6: critically present different numerical methods to solve different types of physical and technical problems;
- CO7: implement numerical algorithms into C-program and visualize the results of the computations
- CO8: demonstrate the ability to estimate the errors in the use of numerical methods

PHY-356 B: Elements of Materials science

After successful completion of the course the student will be able to:

- CO1: Define and outline the rules of solubility, deformation in metals, basic concepts in phase diagram, molecular phases and the concept of smart materials.
- CO2: Explain the imperfections in solids, mechanism of plastic deformation by slip, properties of ceramic materials, the importance and objective of phase diagram.
- CO3: Calculate and solve problems on stress and strain of materials, CRSS of single-phase metals, weight in percentage of compositions using lever rule.
- CO4: List the defects in solids, diffusion mechanisms and types of phase diagram.
- CO5: Classify between elastic deformation and plastic deformation, linear polymers and cross-linked polymers.
- CO6: Derive the CRSS of metals and the lever rule for phase diagrams.

CO7: Discuss the types of smart materials, properties of smart materials and their applications.

CO8: Summarize the concept of polymers and the process of polymerization.

PHY-361: Solid State Physics

After successful completion of the course the student will be able to:

CO1: Define crystal structure to develop it in 2D as well as 3D and to determine Indices for 'Directions' and 'Planes' in a crystal structure.

CO2: Give original examples of crystal structures and to analyze them with packing fraction, coordination number, number of atoms per unit cell etc.

CO3: Derive Bragg Diffraction condition in direct lattice and to relate it in reciprocal lattice using Ewald construction.

CO4: Classify the crystal structure by XRD diffraction and to simplify formula for inter-planer distance.

CO5: Illustrate various experimental techniques for characterisation of material.

CO6: Apply free electron theory to restate thermal and electrical properties

CO7: Explain superconductivity and Meissner effect

CO8: Define magnetic properties of material and to derive susceptibility formula for different magnetic materials using Langevin theory.

PHY-362: Quantum Mechanics

After successful completion of the course the student will be able to:

CO1: outline the historical aspects of development of quantum mechanics;

CO2: explain the differences between classical and quantum mechanics;

CO3: describe matter waves, wave function and uncertainty principle;

CO4: describe Schrodinger's equation and its steady state form;

CO5: solve Schrodinger's steady state equation for simple potentials to obtain eigen functions and eigen values

CO6: apply Schrodinger's steady state equation for spherically symmetric potentials obtain eigen functions and eigen values;

CO7: interpret quantum numbers in atomic system;

CO8: discuss operator algebra in quantum mechanics.

PHY-363: Thermodynamics and Statistical Physics

After successful completion of the course the student will be able to:

CO1: Describe transport phenomena and compute coefficient of thermal conductivity, viscosity and diffusion in terms of mean free path

CO2: Define and discuss the concepts and roles of thermodynamic functions from the view point of statistical mechanics

CO3: Derive Binomial distribution and Gaussian probability distribution using random walk problem and calculate mean values for a statistical system

CO4: Discuss the concepts of microstate and macro state, basic postulates and behaviour of density of states for model system and calculate the number of microstates for different statistical systems

CO5: Differentiate thermal, mechanical and general interaction between statistical system

CO6: Derive and compare Maxwell Boltzmann, Bose-Einstein and Fermi-Dirac distributions; state where they are applicable and explain the connection between classical

CO7: Derive probability distribution formula for micro canonical, canonical ensemble and calculate mean values in canonical ensemble

CO8: Discuss applications for canonical ensemble

PHY-364: Nuclear Physics

After successful completion of the course the student will be able to:

- CO1: Define threshold voltage, dead time and recovery time in GM counter, threshold energy, nuclear fission, nuclear fusion, critical size, critical mass.
- CO2: Determine the basic properties of nucleus.
- CO3: Classify nuclear radiations, elementary particles and nuclear states, nuclear detectors.
- CO4: Compose baryons and mesons with Quark model.
- CO5: Derive expression for energy of ions and frequency of RF signal in cyclotron, Q-value equation, threshold energy, decay constant.
- CO6: Estimate binding energy from fission
- CO7: Justify nuclear reactions using conservation laws
- CO8: Explain the different processes by which energetic particles interact with matter, kinematics of various reactors and decay processes.

PHY-365(A): Electronics II

After successful completion of the course the student will be able to:

- CO1: Define and state the meaning of terms such as amplification, voltage gain, line and load regulation, flip-flop, counters, register, distortion, multiplexer, de-multiplexer, etc.
- CO2: Draw and explain characteristics of various types of FET's and various types of diode and construct a circuit using these components according to application.
- CO3: Draw and explain block diagram of IC 723, IC555, OPAMP.
- CO4: Compare various types of semiconductor diode (LED, photodiode, etc.) types of multivibrator, types of power amplifier and types of three pin regulators (78XX, 79XX, etc.) on the basis of working principle and application.
- CO5: Design and construct a circuit for amplifier, a-stable, mono-stable and bi stable multivibrator using IC555, low voltage and high voltage regulator using IC723, various types of flip-flop and counters.
- CO6: Use OPAMP (IC723) as an adder, subtractor, differentiator, integrator and comparator.
- CO7: Represent POS and SOP expression on K-map and design of half adder, full adder, half subtractor, full subtractor using K-map.
- CO8: Explain applications of LED, photodiode, varactor, power amplifiers, FET, UJT, counters, registers and solve the problems such as write the output for given circuit, design the circuit from given data.

PHY-366 (R) : Lasers

After successful completion of the course the student will be able to:

- CO1: Explain the interaction of radiation with matter, Quantum behaviour of light, thermal equilibrium and population inversion.
- CO2: Illustrate the absorption, spontaneous and stimulated emission with appropriate diagrams.
- CO3: Derive the Einstein's relation, conditions for large stimulated emission and light amplification.
- CO4: Distinguish between ordinary light and laser light.
- CO5: Define the characteristics of laser light.
- CO6: Classify between lifetime broadening, collision and Doppler broadening.
- CO7: List the types of lasers.
- CO8: Discuss the applications of lasers in various fields.

PHY-357 and PHY-367: Physics Laboratory-3A and 4A

After successful completion of the course the student will be able to:

- CO1: Describe the underlying theory of experiments in the course.
- CO2: Perform derivations of theoretical models of relevance for the experiments in the course.
- CO3: Follow instructions to perform laboratory experiments in Optics, Thermodynamics, Mechanics, Modern Physics, Electronics and Electromagnetics.
- CO4: Document their results, using correct procedures and protocols.
- CO5: Perform a quantitative analysis of experimental data including the use of computational and statistical methods where relevant.
- CO6: Interpret relationships in graphed data and develop an intuition for alternative plotting methods and communicate results from laboratory experiments, orally or in a written laboratory report.
- CO7: Calculate permissible standard error in any physics experiment
- CO8: Derive conclusions from the analysis of own data.
- CO9: Assess the language used to describe physics experiments and how it can alter perceptions of the method and results

PHY-358 and PHY-368: Physics Laboratory-3A and 4A

After successful completion of the course the student will be able to:

- CO1: Describe the underlying theory of experiments in the course.
- CO2: Perform derivations of theoretical models of relevance for the experiments in the course.
- CO3: Follow instructions to perform laboratory experiments in Optics, Thermodynamics, Mechanics, Modern Physics, Electronics and Electromagnetics.
- CO4: Document their results, using correct procedures and protocols.
- CO5: Perform a quantitative analysis of experimental data including the use of computational and statistical methods where relevant.
- CO6: Interpret relationships in graphed data and develop an intuition for alternative plotting methods and communicate results from laboratory experiments, orally or in a written laboratory report.
- CO7: Calculate permissible standard error in any physics experiment
- CO8: Derive conclusions from the analysis of own data.
- CO9: Assess the language used to describe physics experiments and how it can alter perceptions of the method and results

PHY-359 and PHY-369 : Project I and Project II

After successful completion of the course the student will be able to

- CO1: design and test hypothesis
- CO2: Describe the underlying theory of experiments in the course.
- CO3: Perform derivations of theoretical models of relevance for the experiments in the course.
- CO4: Document their results, using correct procedures and protocols.
- CO5: Perform a quantitative analysis of experimental data including the use of computational and statistical methods where relevant.
- CO6: Interpret relationships in graphed data and develop an intuition for alternative plotting methods and communicate results from laboratory experiments, orally or in a written laboratory report.
- CO7: write a project report with literature review.
- CO8: defend the outcome of project work in scientific manner.

PHY-3510: Skill Enhancement Course-I

PHY-3510(H): Energy Studies

After completion of this course student will be able to:

- CO1: Students become capable of conducting energy audits and give consultancy in that field.
- CO2: Students can design different types of solar heaters for small domestic as well as large scale community level applications.
- CO3: 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.
- CO4: 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.
- CO5: Students can go for research in the fields of super-capacitors, battery technologies, fuel cells and material synthesis for implementation of these technologies.
- CO6: Students become successful entrepreneurs in the energy field.

PHY-3511: Skill Enhancement Course-II

PHY-3511(L): Biomedical Instruments

After completion of this course student will be able to:

- CO1: Students will acquire basic knowledge of biomedical instrumentation.
- CO2: Students can handle and operate different equipment's like ECG, Oxymeter, and Glucometer.
- CO3: Students will be able to record the different health parameters using it.
- CO4: Student will also able to analyze and interpret the recorded data.

PHY-3610: Skill Enhancement Course-I

PHY-3610(V): Solar PV Systems: Installation, Repairing and Maintenance

After completion of this course student will be able to:

- CO1: Learn basics of light conversion in electricity.
- CO2: Hands on training will motivate to use Solar PV system.
- CO3: Become entrepreneur / self-employed.
- CO4: Analyzed of MSEB electricity bill and design and sizing of off-grid PV system
- CO5: Participants will learn about solar PV module and batteries used in solar PV plant

PHY-3611: Skill Enhancement Course-II

PHY-3611(Z): Instrumentation for Agriculture

After completion of this course student will be able to:

- CO1: Able to test soil and water parameters.
 - CO2: Able to develop their own juice extract plant.
 - CO3: Able to developed their own green house.
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Rajgad Dnyanpeeths
Anantrao Thopte College, Bhore

DEPARTMENT OF POLITICS

2.6.1 :- All Program outcomes(PO)				
Program No.	Program	Program outcomes	Subjects	Year
	B.A. Political Science	1 Development of citizenship	B.A. (politics)	
		2. Constitutional awareness	B.A. (politics)	
		3. Develop ideological base	B.A. (politics)	
		4. Develop International perspective	B.A. (politics)	
		5. Introduction to Fundamental Right	B.A. (politics)	
		6. Human right and values	B.A. (politics)	
		7. Social Justice	B.A. (politics)	

2.6.1 :- Courses outcomes for All Courses					
SR.No.	Program	Course Code	Course Name	Semester	Courses outcomes
1	F.Y.B.A. Politics	11161	Politics G1	Sem-I	Study in detail the political structure both Constitutional and Administrative.
2	F.Y.B.A. Politics	12161	Politics G1	Sem-II	To familiarize students with the working of the Constitution of India. Study the political processes and the actual functioning of the political system .
3	S.Y.B.A. Politics	23164	Politics G2	Sem-III	Study the concepts, ideas and theories in political theory. Role of different political ideologies and their impact in politics.
4	S.Y.B.A. Politics	24164	Politics G2	Sem-IV	Explained the evolution and usage of these concepts, ideas and theories with reference to individual thinkers both historically and analytically.
5	S.Y.B.A. Politics	23161	Politics Special I	Sem-III	Major traditions of thought that have shaped political discourse in different parts of the world. The great diversity of social contexts and philosophical visions.
6	S.Y.B.A. Politics	24161	Politics Special I	Sem-IV	The history of political thought as a series of critical, interconnected and open-ended conversations about the ends and means of the good life.
7	S.Y.B.A. Politics	23162	Politics Special II	Sem-III	Complex relationship between the communication, media and power politics. History of Political Journalism
8	S.Y.B.A. Politics	24162	Politics Special II	Sem-IV	Critical appraisal of practices of political image management, campaigns, propaganda and censorship.
9	S.Y.B.A. Politics	23165	Politics Special SEC	Sem-III	To acquaint students with the important features of the Constitution of India and with the basic framework of Indian Government.
10	S.Y.B.A. Politics	24165	Politics Special SEC	Sem-IV	This paper focuses in detail on the political processes and the actual functioning of the political system. It emphasizes on local influences that derive from social stratification of jatis, from language, religion, ethic and economic determinants and critically assesses its the political processes.
11	T.Y.B.A. Politics	35163	Politics G3	Sem-V	This course will introduce the overall scope of the sub-discipline of Modern Political Analysis. The focus of the course will be on the Modern Political Analysis of Power. The emphasis is on the nature of power in modern societies. More in the form of organizations an social formations than as individual power.
12	T.Y.B.A. Politics		Politics G3	Sem-VI	Students are also expected to understand different forms of justifications of power and the role of ideology in this regard. State will be studied as a repository of power in society while class and patriarchy are two instance of how the nature of power is shaped by social factors.
13	T.Y.B.A. Politics	35161	Politics Special III	Sem-V	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.
14	T.Y.B.A. Politics		Politics Special III	Sem-VI	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 process of change. The recent developments and particularly the emergence of New Public Administrations are incorporated within the larger paradigm of democratic legitimacy.
15	T.Y.B.A. Politics	35162	Politics Special IV	Sem-V	1. This paper deals with concepts and dimensions of International Relations and makes an analysis of different theories highlighting the major debates and differences with in the different theoretical paradigms. Approaches to the Study of International Relations

16	T.Y.B.A. Politics		Politics Special IV	Sem-VI	2. Study the Changing Nature of the National Power . 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.
17	T.Y.B.A. Politics	35165	Politics Special SEC	Sem-V	This course is an introduction to the political process in Maharashtra with special reference to regionalism sub-regionalism and Samyukta Maharashtra Movement. 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.
	T.Y.B.A. Politics		Politics Special SEC	Sem-VI	It tries to acquaint 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.

**Rajgad Dnyanpeeths
Anantrao Thopte College, Bhore
Department of Zoology**

Program Outcomes, Program Specific Outcomes and Course Outcomes of

B.Sc. in Zoology

B. Sc. (Zoology) Programme

B.Sc. in Zoology is an undergraduate Program in Zoology. Zoology is the branch of science which deals with the study of animal kingdom including the evolution, structure, Physiology, classification, embryology, habits, habitat and distribution of all the animals. The B.Sc. Zoology course is premeditated to introduce students to the study of zoology at the organismal and organ function levels. The theoretical part of the program deals with the general principles of classical as well as modern zoology. The program provides the student with an introduction to the recent advances in zoology in the areas of systematic, evolution, reproduction, development, animal diversity, biochemistry, cytology and animal ecology. This course is offered for candidates who are interested in the study of animals. The minimum time required to complete the course is three years.

Objectives:

Imparting quality education in Zoology has been the focus of the department right from its inception. Emphasis is given on education both within and outside the classroom.

The Department is dedicated to fulfill the following objectives through the curricular and co-curricular activities:

- To provide students with knowledge of fundamental principles in zoology that will provide a foundation for their later advanced course in more specific biological subjects.
- To make students familiar with animal classification schemes and other applied courses as well as developing an understanding of and ability to apply basic zoological principles.
- To integrate the laboratory and lecture sections of the course and directed toward teaching students both in the classroom and on the field.
- To provide quality education offering skill based programs and motivate the students for self-employment in applied branches of Zoology.
- To inculcate the value based education and entrepreneurial skills among the students.
- To create awareness on environmental issues through various activities.

Programme Outcomes:

After successfully completing B. Sc. (Zoology) Programme students will be able to:

PO1. Communicate scientific information through effective formal and informal methods generally used in sciences.

PO2. Conduct basic scientific research and provide inputs for societal benefits.

PO3. Develop competence in basic sciences and in the content of the specific courses

that constitute the principal knowledge of their degree.

PO4. Compare and contrast the characteristics of animals that differentiate them from other forms of life.

PO5. Acquire the skills in handling scientific instruments, planning and performing in laboratory experiments.

PO6. Understand and be aware of relevant theories, paradigms, concepts and principles of zoology.

PO7: Understand the structure and functions of cell types

PO8: Acquire time management and self-management skills.

PO9: Relate the various abiotic factors with health of living forms and ecosystems.

PO10: Explain the role of various biomolecules in living systems

PO11: Apply the knowledge of Zoology to understand the complex life Processes and phenomena.

PO12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning.

Programme Specific Outcomes

PSO1. Ability to connect and apply biological knowledge to other disciplines and to integrate knowledge into their personal and professional lives.

PSO2. Explain the origin of life with context to the origin of eukaryotic cell and endosymbiotic theory of origin., fossil records, Darwinism and Neo- Darwinism, experimental evidences.

PSO3. Illustrate zoological science for its application in branches like medical entomology, apiculture, aquaculture and agriculture etc

PSO4. Understand animal interactions with the environment and identify the major groups of organisms with an emphasis on animals and classify them within a phylogenetic framework.

Course Outcomes

B. Sc. (Zoology) First Year B.Sc.

Course ZO 111 –Animal Diversity I

After successfully completing this course, students will be able to:

- CO1: Demonstrate anatomical and physiological attributes of each animal group and why these have led to their success.
- CO2: Identify a range of invertebrate and vertebrate animals
- CO3: Describe the morphology, habit and habitat. Systematic position and various systems in *Paramecium*.
- CO5: List the various animals in a given phylum.
- CO6: State the animal classification.
- CO7: Enlist the examples of the phylums studied.
- CO8: Comment on the modifications of common animal forms of the groups studied.

Course ZO 121-Animal Diversity II.

After successfully completing this course, students will be able to: CO1:

List the various animals in a given phylum of invertebrates

- CO2: Identify various larval stages and development in invertebrate groups
- CO3: Explain various modifications in these groups and the need of the modification for survival.
- CO4: Explain various adaptations in insects including mimicry and metamorphosis
- CO5: Describe the morphology, habit and habitat, systematic position and various systems in Star fish.
- CO6: State the outline of animal classification of non-chordates
- CO7: Classify the higher invertebrate groups.

Course: ZO 122 Cell Biology

After successfully completing this course, students will be able to: CO1: Differentiate prokaryotic and Eukaryotic cells.

- CO2: Explain the principles of staining.
- CO3: Describe the structure and functions of cell organelles.
- CO4: Label the various cell parts and Cell organelles.
- CO5: Explain the cell division process and its significance.

ZO112 : Animal ecology

- CO1: identify and evaluate impact on ecosystem
- CO2: analyse and understand issues to conserve nature
- CO3: explain link to food chain , food web , biotic and abiotic components
- CO4: describe population community , animal interactions .

Course: ZO 113 and 123 Practicals in Zoology:

After successfully completing this course, students will be able to: CO1: Identify various animals based on morphological features.

CO2: Prepare the culture of *Paramecium*

CO3: Prepare stained slides of mitosis.

CO4: Identify the cell division phases

CO5: Detect human blood group

CO7: Identify the cell organelles.

B. Sc. (Zoology) Second Year B.Sc.

Course ZO 231-Animal Diversity III.

After successfully completing this course, students will be able to:

CO1: List the various animals in a given phylum of invertebrates

CO2: Identify various larval stages and development in invertebrate groups

CO3: Explain various modifications in these groups and the need of the modification for survival.

CO4: Explain various adaptations in insects including mimicry and metamorphosis

CO5: Describe the morphology, habit and habitat, systematic position and various systems in Star fish.

CO6: State the outline of animal classification of non-chordates

CO7: Classify the higher invertebrate groups.

CO8: Categorize the diversity found in the invertebrate groups of animals like Arthropoda, Mollusca and Echinodermata.

Course ZO 232: Applied Zoology I

After successfully completing this course, students will be able to:

CO1: Define the concepts of the applied subjects like Fisheries, Aquaculture and Pest Control.

CO2: Identify, freshwater, Marine water fishes.

CO3: Explain the tools and techniques used in aquaculture and agricultural practices.

CO4: Describe the fish species commonly used in fishery business.

CO5: Describe the common agricultural pests from nearby area.

CO6: Illustrate the diseases in aquaculture and agriculture.

CO7: Classify freshwater and Marine water fishes.

CO8: Categorize economically important fish species.

Course ZO241-Animal Diversity IV.

After successfully completing this course, students will be able to:

- CO1: List the various vertebrate animals in a given class.
- CO2: Identify poisonous and non-poisonous snakes.
- CO3: Explain various modifications in the given group of animals.
- CO4: Explain various adaptations in avian group as well as migration and flight in birds.
- CO5: Describe the morphology, habit and habitat. Systematic position and various systems in *Scoliodon*.
- CO6: State the outline of chordate classification.
- CO7: Classify the higher vertebrate groups.
- CO8: Categorize the diversity found in the vertebrate groups of animals like reptiles, birds and mammals.

Course ZO242: Applied Zoology II

After successfully completing this course, students will be able to:

- CO 1: Define the concepts of the applied subjects like Apiculture and Sericulture.
- CO 2: Identify different species and casts of honeybees and species of silkworm.
- CO 3: Explain the tools and techniques used in apiculture and sericulture.
- CO 4: Explain the important pests of apiculture and sericulture.
- CO 5: Describe the economic importance of honeybee and silkworm.
- CO 6: Illustrate management of the apiary and sericulture units.
- CO 7: Classify of *Apis*, *Bombyx* and *Anthereria*.
- CO 8: Select economically important species of *Apis* for unifloral and multifloral honey production.

Course ZO 233 and 243 : Practicals in Zoology:

After successfully completing this course, students will be able to:

- CO1: Identify animals of higher groups in Invertebrates and Vertebrates.
- CO2: Distinguish between poisonous and non-poisonous snakes
- CO3: Label various parts of the animals and their modifications
- CO4: Observe the various tools, crafts and gears used in Apiary, Fishery, Sericulture and Pest control.
- CO5: Identify the pests in agriculture and enemies in Apiary
- CO6: Explain the modifications and adaptations in animals
- CO7: Explain the use of tools in Apiary, Sericulture and appliances in Pest control.
- CO8: Describe External features and economic importance of freshwater and Marine water fishes and other aquaculture organisms
- CO9: Describe the morphology, habit and habitat. Systematic position and various systems in starfish and *Scoliodon*

