PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOME AND COURSE OUTCOME

The college offers full time under graduate degree programme in Arts and Science streams under Manipur University. Students require three years full time study consisting of six semesters to complete a programme.

The Bachelor of Arts provides students with a broad range of disciplinary studies with a strong focus on aspects of human culture and achievements in social and behavioral sciences. The course aims to provide students with a basis of sound knowledge in their chosen areas of study, the ability to apply the knowledge they have aquired, the ability to communicate effectively in arrange of ways, the ability to work both independently and collaboratively, the skills to connect across geographical, disciplinary, social and cultural boundaries, an understanding of the value of ethical behavior, independent and lifelong learning skills.

The Bachelor of Science requires three years of full time study consisting of six semesters. It translates in making a significant investment in one's professional career. In addition to the enhanced career prospects students also develop valuable personal skills and fulfill prerequisite to Master studies. It concentrates on providing opportunities for students to show outstanding performance at subject knowledge and understanding, intellectual skills related to the subject, transferable skills and attitudes through introduction of a wide range of topics, reasoning through unfamiliar problems, critical and analytical thinking. It provides the tools to investigate topics in depth, in order to find a systematic approach in analyzing and building up knowledge to reach a solution. The developments of teamwork and leadership abilities are imbibed to give importance to Safe Laboratory Practice.

PROGRAMME OUTCOME

1. **BACHELOR OF ARTS**
   PO:1- Specific, measurable statements of what graduating / existing students should know, be able to do , believe or value after completing the program.
   PO:2- Depends on the program mission statements.
   PO:3- Students summarize Language acquisition theory and research.
   PO:4- Students evaluate pedagogical materials.
   PO:5- Students build the multidimensional personality and able to correlate Languages with social sciences.
   PO:6- Demonstrate proficiency in a range of techniques and media.
   PO:7- Communication: Demonstrate familiarity with and ability to analyze both verbally and in writing issues and forms of contemporary art with a clear understanding of historical precedents.
   PO:8- Critical Thinking: Demonstrate the ability to articulate an insightful response and analysis of a work of art in order to participate in discussions and studio critiques.

2. **BACHELOR OF SCIENCE**

   PO-1: Conduct research relevant to a scientific issue, evaluate different sources of information including secondary data, understanding that a source may lack detail or show bias.

   PO-2: Appreciate the role of science in society; and its personal, social and global importance; and how society influences scientific research.

   PO-3: To understand and analyze data (qualitatively/quantitatively) to identify patterns and relationships, identify anomalous observations, draw and justify conclusions

   PO-4: To recognize questions that are appropriate for scientific investigation, pose testable hypotheses, and evaluate and compare strategies for investigating hypotheses.

   PO-5: Understand the role of science in society; and its personal, social and global importance.

PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES

PROGRAMME   :   **BACHELOR OF ARTS**
NAME OF THE DEPARTMENT   :   **ECONOMICS**
PROGRAMME SPECIFIC OUTCOME:

   PSO1: Understand clearly the basic concepts of economics.
   PSO2: Analysis economic behavior what is happening in day-to –day life.
   PSO3: Develop the attitude towards economic way of thinking.
   PSO4: Examine historical and current events from economic perspective.
   PSO5: Apply statistical tools in economic analysis.
   PSO6: Suggest various measures to economic problems.
   PSO7: Learn economic development issues in India and around the world.
   PSO8: Understand some basics of environmental problems and solutions.
   PSO9: Acquaint with the various historical economic thoughts profound by various schools.
   PSO10: Understand some basic foreign trade theories.

COURSE OUTCOMES
   1. **SEMESTER I**
      Course Code: ECO 101
      Title: Indian Economic Problems
      On Completion of the course students are able to understand:
      CO 1. The basic features of Indian economy, trends of national income and PCI, and composition national income.
      CO 2. The Interationship between natural resources, economic development and population.
      CO 3. Agricultural development
      CO 4. Industrialization since independence.
      CO 5. Issues relating to foreign trade, unemployment and poverty.

   2. **SEMESTER II**
      Course Code: ECO 202
      Title: Micro Economics I
      On completion of the course students will comprehend:
      CO 1. The various concept of micro-economics
      CO 2. Cardinal and ordinal theories of demand and concepts consumer supplies and elasticity of demand.
      CO 3. Maximization of output, opimal expansion of plant, theories of cost and economies of scale.
      CO 4. Equilibrium of a firm under perfect completion and monopoly
      CO 5. Equilibrium of a firm under monopolistic competition and oligopoly.

3. **SEMESTER III**
   Course Code: ECO 303
   Title: Micro Economics II
   On completion of the course students will be able to:-

   CO1: understand price and employment of factors and equilibrium of factors in different markets.
   CO2: Learn general equilibrium and income distribution.
   CO3: explain social welfare functions.
   CO4: understand concepts of externalities, market failure, common property and public goods.
   CO5: write about the concepts of asymmetric information, market for lemons- market signaling moral hazard and principal- agent problem.

4. **SEMESTER IV**
   Course Code: ECO 404
   Title: Macro Economics
   After the completion of the course a student is expected to:-
   CO1: Understand classical theory of income and employment.
   CO2: Understand Keynesian theory of income and employment.
   CO3: Understand general equilibrium by using IS and LM curers and the application of IS and LM curve to fiscal and monetary policies,
   CO4: Have clear idea about inflation theories, Phillip's curve and money supply.
   CO5: Learn the introduction to growth theories –one sector model, Harrod- Domar model and Solow model.

5. **SEMESTER V HONOURS**
   Course Code: ECO H505
   Title: Public Finance

   On completion of the course students will understand
   CO 1. The principle of maximum social advantage and rule of fiscal policy.
   CO 2. Technique and procedure of budgeting and the need of performance budgeting
   CO 3. Various concepts of taxation
   CO 4. Cause and effect of public expenditure. Source of public borrowing and their burden on the economy.
   CO 5. Fiscal federalism with reference to the latest FC and implication of FRBM.

   Course Code: ECO H506
   Title: Political Economy of Development
   On completion of the course students are expected to understand:
   CO 1. The scope of the political economy and classical and Mercian political economies
   CO 2. The idea of feudalism as made of production and accumulation of capital, and relation between Mercian capital and industrial evolution
   CO 3. Characteristics of capitalism as a made of production
   CO 4. Political economy of globalization and structural adjustment
   CO 5. Political economy of India-feudalism and agrarian relationship during pre and poor economic liberalization

Course Code: ECO H507
Title: Quantitative Methods of Economic Analysis
After completion of the course a student will be able to:-

CO1: learn basic concepts of statistics such as measures of central tendency and dispersion and ingredients of mathematical model and matrix algebra.
CO2: Understand differential calculus (including optimization) and its economic applications.
CO3: Have clear idea about elementary probability theory including probability distribution.
CO4: Understand correlation analysis, regression analysis, time series analysis- fitting a trend line using least square method.
CO5: Learn the concept of index number and construction of index numbers.

6. **SEMESTER VI HONOURS**
   Course Code: ECO H608
   Title: Development Economics
   On completion of the course students are able to understand
   CO 1. The concept of growths and development
   CO 2. Strategies of developments
   CO 3. Policy issues relating to development
   CO 3. Various foreign trade policies
   CO 4. Concept of planning.

Course Code: ECO H609
Title: Environmental Economics
This paper mainly helps to understand:-

CO1: Basic concepts of environmental economics, the interdependence between economy and environmental economics, the laws of thermodynamics and environmental economics
CO2: Problem of climate change and policy measures for solving the problem through standards via command and control and economic policy instruments.
CO3: The concepts of market failure, pollution externalities, public goods, property rights and common property resources- with relation to environmental economics.
CO4: Problems of renewable and non-renewable extraction under monopoly and perfect markets.
CO5: Environmental Kuznets curer and sustained economic development.

Course Code: ECO H610
Title: International Economics Sem-6
On completion of the course students are exacted to understand:
CO 1. The importance of international trade and classical theories of foreign trade.
CO 2. Modern foreign trade theory of Heckcher-Ohlin
CO 3. Balance of payments accounting and equilibrium and exchange rate determination.
CO 4. Benefit of free trade vs protectionism.
CO 5. Relevance of world economic bodies to the trade policies of developing countries.

7. **SEMESTER V GENERAL**
    Course Code: ECO G505
    Title: Introduction to quantitative methods for economic analysis
    On the completion of the course students are expected to understand:
    CO 1. Basic concepts of mathematics.
    CO 2. Derivative of a function and its application in economics
    CO 3. Probability of an event and probability distribution.
    CO 4. Correlation and regression analysis
    CO 5. Uses of index numbers.

8. **SEMESTER VI GENERAL**
    Course Code: ECO G606
    Title: Issues in Economic Development
    On completion of the course students will able to understand:
    CO 1. Basic concepts of political economy.
    CO 2. Balance and unbalance growth strategies.
    CO 3. The significance of public economics and the basic concepts of public economics.
    CO 4. The introductory ideas of environmental economics.
    CO 5. Classical theories of foreign trade and the idea about 3 world economic bodies.

PROGRAMME   :   BACHELOR OF ARTS
NAME OF THE DEPARTMENT   :   EDUCATION
PROGRAMME SPECIFIC OUTCOME:
    PSO 1: Understanding the roles of philosophy and sociology in education.
    PSO 2: Acquiring the structure and functions of higher mental processes in teaching
           learning process.
    PSO 3: Analyze the development of education in India as well as in Manipur.
    PSO 4: Examine historical and current events, approaches from educational perspectives.
    PSO 5: Develop attitude towards evaluation and apply statistical tools.
    PSO 6: Suggest planning and management in education.
    PSO 7: Guiding, Recognition, Prevention Remedying of learning difficulties of students.
    PSO 8: Learn different educators' thought.
    PSO 9: Understanding the different stages of life and adjustment.
    PSO 10: Acquaint with some basic concept of research methodology and statistical analysis.

COURSE OUTCOMES
1. **Semester I**
    Paper: ES: 101
    Title: Philosophical and Sociological Foundations of Education.
    CO 1:   To enable the learners to:
    i.   Understand the meaning, scope and different aims of education.
    ii.   Analyse the Indian and Western concepts of Education.
    iii.   Understand the importance of education in life and classify about the different agencies of
           education.
    iv.   Understand and appreciate the social, moral and spiritual values of life.

CO2:   To enable the learners to:
i.   Understand the meaning of philosophy and its relationship with education and the influences of various schools of philosophical thoughts, viz., Idealism, Naturalism, Pragmatism and Realism on educational programmes.
ii.   Explain the similarities and differences among the various issues and schools of philosophy and their educational implications.
iii.   Analyse the educational contributions of Plato, Aristotle, Rousseau, Froebel and Dewey with reference to concept of education, aims, curriculum, teaching methods, discipline and role of teacher.

CO3:   To enable the learners to:
i.   Understand the concepts of freedom and discipline and their relevance in one's life.
ii.   Acquire knowledge about democratic values of life.
iii.   Grasp the importance of discipline in individual and social life.

CO4:   To enable the learners to:
i.   Understand and define educational sociology and its importance.
ii.   Describe the various sociological approaches in education.
iii.   Explain the importance of education in maintaining society's progress.
iv.   Understand the school community as part of the society.
v.   Appraise mass media as a social means.

CO5   To enable the learners to:
i.   Describe social groups, social interaction and social stratification.
ii.   Understand the concept of culture, its characteristics and the relationship between education and culture.
iii.   Get acquainted about the various social problems.
iv.   Develop conceptual understanding about the role of community in solving social problems in the field of education.

2. **Semester II**
    Paper: ES: 201
    Title: Educational Psychology and Pedagogy

    CO1:   Definition of Psychology its relationship with Education
            Nature Scope and methods of educational Psychology
            Appliction of educational psychology in teaching learning
            Psychological basis of mental life

    CO2:   Personality its type and traits, Theories of personality
            Determinants of personalities

    CO3:   Meaning Nature amd factors of learning
            Learning and maturation; Learning and motivation
            Theories of learning

    CO4:   Pedagogy and its implications
            Science of teaching – relationship between teaching and learning
            Factors affecting teaching learning process

CO5:   Classroom behaviour- Characteristics of good teacher behaviour
Flander's interaction analysis
Traditional, Micro and Macro teaching

3. **Semester III**
    Paper: ES: 301
    Title: Development of Education in India

    CO 1:   To enable the learners to understand the system of Ancient Indian Education during Vedic and Buddhist periods.
    CO2:   The learners will be able to understand the system of education in Medieval India.
    CO3:   To enable the learners to:
    i.   Gain knowledge about the influence of Britishers on Indian Education.
    ii.   Comprehend the impact of British Commissions and Committees on Indian Education.
    CO4:   To enable the learners to:
    i.   Understand the growth and development of Indian education in Post-independence era.
    ii.   Learn the importance of various Education Commissions of India in Post-independence period.
    iii. Comprehend the National Policy on Education (1986) and Programme of Action (1992).
    CO5   The learners will be able to understand and explore the historical perspectives of the development of education (elementary, secondary, higher and teacher education) in Manipur during pre-independence and post-independence periods.

4. **Semester IV**
    Paper :ES 401
    Title: Issues and Trends in Contemporary Indian Education
    CO1:   To develop the students' understanding of basic aspects and problems relatingto elementary and secondary education ,the functions of various organizations in education
    CO2:   To enable students the initiatives and actions taken by Government of India in providing alternatives for schooling
    CO3:   To understand the students some of the important modern trends in education
    CO4:   To understand open learning system
    CO5:   Enable students to understand different life skills in education

5. **Semester V (Hons)**
    Paper: ES(H): 505
    Title: Educatinal Evaluation and Statistics in Education

    CO1:   Educational evaluation – Meaning and scope of educational measurement
    Need for measurement in education
    Concept of evaluation in education

    CO2:   Types of evaluations – Formative and Summative
    Quantitative and qualitative evaluation
    Principles amd techniques of Continuous and Comprehensive Evaluation

    CO3:   Measuring instruments and their classification
    General principles of test construction and standardization

CO4:   Statistics in Education – meaning, nature and scope

CO5:   Types of data and bivariate distribution

Paper: ES (H): 506
Title: Educational Management and Educational Technology
CO 1:   To enable the learners to:
  i.   Acquire knowledge about the theoretical concepts of educational management.
  ii.   Identify the various types of educational management.
CO2:   To enable the learners to:
  i.   Develop an insight into the theoretical concepts of financial management.
  ii.   Acquire knowledge about the management of educational finance.
  iii.   Comprehend the factors affecting managerial behaviour.
CO3:   To enable the learners to:
  i.   Understand the concept, need and importance of educational planning.
  ii.   Describe the various types and strategies of educational planning
  iii.   Understand the concepts of Institutional Planning.
CO4:   To enable the learners to:
  i.   Understand the concept, scope and importance of educational Technology.
  ii.   Become aware of the fundamentals of various hardware and technologies in educational context.
  iii.   Implement various techniques in educational practice.
  iv.   Understand the theoretical concepts, nature, types, process and components of communication process.
  v.   Develop understanding of the importance of mass media approaches in Educational Technology.

CO5   To enable the learners to:
  i.   Critically analyse the system approach in educational process.
  ii.   Acquaint the knowledge of innovations such as Programmed Learning Material, Personalized System in Instruction, CAI, Simulated Teaching and Distance Teaching in Educational Technology.

Paper: ES (H) 507
Title: Educational Guidance and curriculum construction
C01:   To help students understand concept, need, principle and types of guidance.
CO2:   To help students understand purpose, functions and implications of vocational guidance.
CO3:   To help students understand counseling, types, steps and techniques.
CO4:   To understand students the role of counselor and relationship between guidance, counseling and teaching at secondary school stage.
CO5:   To acquaint students the principle of curriculum and its significance.
CO6:   To suggest the process of the development of curriculum and its roles at different levels.
CO7:   To analyze the curriculum development process according to National Curriculum Framework.

6. Semester VI (Hons)
Paper: ES (H) 608
Title: Educational Thought and Practices.
CO1: To help the students understand the educational aims, methods of teaching , role of the teacher and contributions of Rousseau 's in the field of education.
CO2: To understand different aspects of education and contributions of John Dewey.
CO3: To understand students about Rabindranath Tagore and his Shantiniketan and Vishwa Bharati.
CO4: Learn the students about the education of swami Vivekananda.
CO5: Acquire students the education of M.K. Gandhiji, his main tenets and basic education.

Paper: ES (H) 609
Title: Child Psychology
CO1: Relevance of child development to educational practice
Importance of early childhood years, Modern approach to child study

CO2: General nature of growth and development – principles, factors affecting development
Development during the pre-natal, post-natal and neo-natal stages

CO3: Development upto pre-adolescence- physical and motor development
Speech and language development, perceptual development
Emotion development, social development, process of socialization

CO4: Development of understanding and intelligence – concept formation, readiness and maturation as related to learning
Value of play, types of play, Play and child development
Individual differences in abilities, interest and their educational implications

CO5: Development of self and personality – fundamental needs and their satisfaction
Role of family, school, peers
Problems of adjustment, normal and abnormal patterns of behaviour in different stages

Paper: ES (H) 610
Title: Experimental Education and Statistics

CO1: Experimantal work and test administration

CO2: Test Development statistical indices

CO3: Project work

PROGRAMME   :   BACHELOR OF ARTS
NAME OF THE DEPARTMENT   :   ENGLISH
PROGRAMME SPECIFIC OUTCOME:

PSO 1:   Understand the basics of grammar, usage and effective communication and comprehend certain form of literature like short stories.

PSO 2:   Perspective of literary movements that existed from Old English Period to 19th Century. Familiarity with poetry as well as drama also emphasized.

PSO 3:   Develop keen knowledge on the development of British fiction.

PSO 4:   Define literary theory and terms in criticism.

PSO 5:   Develop the knowledge of grammatical system of English language.

PSO 6:   Apprehend 20th Century British Literature, Indian Writing in English, North East Literature, Commonwealth and American Literature as well as European Literature in Translation.

Course Outcomes:

Semester I

Course Code: General English I

After the completion of the course students will be able to understand

CO 1:   The course is intended to introduce the students to the basics of grammar, usage, and effective communication.

Semester I

Course Code: Elective English (E$_1$-101) Title: English Literature: History, Poetry and Drama (Old English to 19th Century)

After completion of this course, students will be able to

CO 1:   Trace the developmental history of English Literature from Old English Period to 19th Century.

CO2:   Show familiarity with major literary works by British writers in the field of Drama and Poetry.

CO3:   Be acquainted with major religious, political and social movements from 14th to 19th century and their influence on literature.

CO 4:   Learn various interpretative techniques to approach literary texts of various genres.

Semester II

Course Code: General English II

After completion of this course, students will be able to

CO1:   Appreciate the work of Shakespearean drama as well as value dramas to be a source of great wisdom.

CO2:   Appreciate a wide range of poetry ranging from the times of Shakespeare to the modern period.

CO3:   Show familiarity with major works by British, American and Indian poets.

Semester II

Course Code: Elective English (E$_2$-202) Title: British Fiction

After completing the course, students will be able to

CO1:   Know how and why British Fiction emerged as a distinct field of study.

CO2:   Trace the development of history of British Fiction from its beginning.

CO3:   Interpret the works of great writers of British Fiction.

CO4:   Demonstrate, through discussion and writing, an understanding of significant cultural and societal issues presented in British Fiction

Semester III

Course Code: Elective English (E$_3$-303) Title: Western Criticism

After completion of this course, students will be able to

CO1: Learn the history of literary criticism and trace the development of literary criticism.

CO2: Apply critical and technical virtuosity to describe and analyze, and formulate an argument about literary and other texts.

CO3: To have an insight into the great works of western critics and appreciate their works.

CO4: Develop a skill in applying various perspective and outlook in interpreting a specific text.

CO5: Understand various critical terms and technique that will be important in analysis of various works of literature.

Semester IV

Course Code: Elective English (E$_4$-404) Title: Linguistics and English Language

After completion of this course, students will be able

CO1: To familiarize students with the speech sounds and the phonological aspects of the English language.

CO2: To lead to a greater understanding of the human communicative action through an objective study of language.

CO3: To familiarize students with the key concepts of linguistics and develop awareness of the latest trends in language study.

CO4: To help students move towards better and intelligible pronunciation and to improve general standard of pronunciation in everyday conversation.

Semester V

Course Code: English Honours Paper (EnH-505) Title: 20th Century British Literature

After completion of this course, students will be able to

CO1: Grasp an understanding of the poems of eminent poets of 20th century and be able to study and interpret representative writings from 20th century.

CO2: Be acquainted with the changing trends in poetry with respect to Victorian poetry.

CO3: Familiarize students with the works of modern British fiction and reflect upon the great upheaval that the literary works has undergone during 20th century.

CO4: Acquaint students with the trends of drama in 20th century and interpret the works as a reflection of the modern world.

Semester V

Course Code: English Honours Paper (EnH-506) Title: Indian Writing In English

After completion of this course, students will be able to

CO1: Know how and why Indian Writing in English emerged as a distinct field of study.

CO2: Trace the development of history of Indian English literature from its beginning to the present day.

CO3: Interpret the works of great writers of Indian writers in English.

CO4: Demonstrate, through discussion and writing, an understanding of significant cultural and societal issues presented in Indian English literature.

Semester V

Course Code: English Honours paper (EnH-507) Title: Literary Theory

After completion of this course, students will be able to

CO1: Learn the history of literary criticism and various literary theories.

CO2: Apply critical and technical theory and vocabulary to describe and analyze, and formulate an argument about literary and other texts.

CO3: Think about the non-fixity of meaning of literary texts.

CO4: Develop a skill in applying various literary theories in interpreting a specific text.

Semester VI

Course Code: English Honours Paper (EnH-608) Title: North-East Literature

After completion of this course, students will be able to

CO1: Know the importance of North-East Literature and its distinct characteristic features.

CO2: Read and understand some of the representative popular literary works.

CO3: Understand how North-East literature is able to provide a literary genre that echoes the social, cultural and political affiliations of the North East India.

CO4: Probe into the literary and aesthetic merits of North-East literature.

Semester VI

Course Code: English Honours Paper (EnH-609) Title: Commonwealth and American Literature

After completion of this course, students will be able

CO1: To acquire knowledge about Commonwealth and American literature, their cultural themes, literary periods and key artistic features.

CO2: To understand the various aspects of Commonwealth and American society through a critical examination of the literary texts representing different periods and cultures.

CO3: Probe into the literary and aesthetic merits of European Literature.

Semester VI

Course Code: English Honours Paper (EnH-610) Title: European Literature in Translation

After completion of this course, students will be able to

CO1: Read and understand about the rich classical texts of Greco-Roman literatures as well as European literatures in translated versions.

CO2: Trace the nature of influence that all the classical texts have on modern English literatures.

CO3: Appreciate European Literature as a source of great wisdom.

CO4: Interpret these texts from contemporary points of view.

CO5: Probe into the literary and aesthetic merits of European Literature.

PROGRAMME   :   BACHELOR OF SCIENCE/ARTS
NAME OF THE DEPARTMENT   :   GEOGRAPHY

PROGRAMME SPECIFIC OUTCOME

PSO1:   The 1st Semester students are introduced to Geography and intended to acquaint with the meaning, nature, scope and development of this discipline.

PSO2:   The 2nd Semester students are expected to briefly learn about every aspects of physical features on the earth's surface.

PSO3:   The 3rd Semester students will be acquainted with nature and scope of human geography. They are introduced to basic geographical and cartographic tools and techniques with hands on practicals.

PSO4:   The 4th Semester students will be able to comprehend the characteristics and dynamics of population and settlement. Further, they are acquainted with more cartographic and statistical tools.

PSO5:   The 5th Semester students will have thorough understanding of various landform features on earth's surface and processes of land formation. They will also comprehend the regional geographical features of India having supported by ground examples. They will be able to interpret geological map, identify or construct various map projections, perform local area surveying by using survey tools like chain & tape, prismatic compass etc.

PSO6:   The 6th Semester students can understand economic aspects of human settlement and development so as to enable to apply on ground economic problems. They are also expected to go through regional geographies of all the continents viz. Asia, Europe, North & South Americas, Africa and Australia so as to enable to spatially differentiate these regions on the basis of physical and cultural aspects. At the same time, they will be proficient with dumpy level and theodolite surveys, remote sensing tools and materials to study landform features, and will be able to conduct field surveys to gather physical and socio-economic data so as to draw inferences of a particular area.

COURSE OUTCOME
PAPER 1: Semester – I (101: Introduction to Geography)

CO1:   Impart knowledge on the emergence of geography as a subject and its relation with other disciplines.

CO2:   Contribution of the ancient scholars on the emergence of geography as a subject with emphasis on the Greeks, Arabs, Germans and French.

CO3:   Discuss on the geographical thoughts like, man-environment relationship, determinism, possibilism, neo-determinism, human ecology, areal differentiation

CO4:   Dualism in Geography – systematic, regional, physical and human

CO5:   Branches of Geography: Physical and Human Geography and their related allied branches.

CO6:   The recent trends of geography in the context of India.

CO7:   Concept of region: macro, meso and micro region.

CO8:   History of cartography, the importance of quantitative technique in cartography.

CO9:   History and uses of Remote sensing and GIS.

CO10:   Importance of fieldwork, physical and socio economic surveys in geography.

PAPER 2: Semester – II (202: Physical Geography)

CO1:   To understand the Solar System and the origin of the earth.
CO2:   To identify rocks – their origin and classification
CO3:   To elaborate the Interior of the earth, Earth movement – orogeny and epeirogenic, earthquakes, volcanoes and the associated major landforms.
CO4:   To discuss weathering: Factors affecting weathering.
CO5:   To discuss and digest Cycle of erosion: erosional work done by river, wind and glacier and their associated landforms.
CO6:   Weather and Climate: insolation, heat budget, vertical, horizontal and seasonal distribution of temperature.
CO7:   Composition and structure of the atmosphere.
CO8:   Atmospheric pressure and winds: planetary, periodic and local winds.
CO9:   Evaporation, condensation and precipitation.
CO10: Cyclones and anticyclones.
CO11: Climatic types and their association with major natural regions.
CO12: Configuration of ocean floor: Temperature and salinity distribution of ocean water, ocean currents, marine deposits, corals and atolls.
CO13: Concept of ecosystem and food chain: global distribution of major plants and animals communities.

PAPER 3(i): Semester – III (303: Human Geography)

CO1:   To introduce nature and scope of human geography
CO2:   To identify approaches to study human geography.
CO3:   To identify branches of human geography.
CO4:   To classify mankind: spatial distribution of racial and linguistic groups.
CO5:   Human adaptation to the environment: cold region, hot region, plateau, mountains and natural hazards.
CO6:   Economic activities of mankind: food gathering, hunting, fishing, vegeculture and shifting cultivation.
CO7:   Modern economic activities: industry, transport and agriculture.
CO8:   Trade and commerce.

PAPER 3(ii): Semester – III (303: Cartography – I)

CO1:   To introduce Scale: Representative fraction, plain linear, diagonal and comparative.
CO2:   Identification of rocks and minerals, fibers and crops.
CO3:   Representation of relief by hachure, shading, contours and layer tints.
CO4:   Representation of different landforms by contours.
CO5:   Drawing of profiles: cross and long profiles, super imposed, projected and composite profiles and their relevance in landform mapping and analysis.
CO6:   Representation of temperature and rainfall data by line and bar graph.
CO7:   Drawing of climograph and hythergraph and their interpretation.
CO8:   Interpretation of Indian weather maps for July and January months.
CO9:   Reading of meteorological instruments – maximum and minimum thermometers, wet and dry thermometers, rain gauge, barometer, wind vane and anemometer.

PAPER 4(i): Semester – IV (404: Population and Settlement Geography)
- CO1: To understand nature and scope of population geography.
- CO2: To discuss the World population growth, density and distribution.
- CO3: Composition of population: age, sex, rural, urban and economic composition.
- CO4: Fertility and mortality with reference to India.
- CO5: Migration: Internal and international.
- CO6: Population problems and policies with reference to India.
- CO7: Nature and scope of settlement geography, evolution of settlement, spatial distribution and their associated factors.
- CO8: Settlement: Rural and Urban, types and pattern.
- CO9: Growth of urban settlement, morphology, urbanization trends.
- CO10: Functional classification of town, urban problems and planning.

PAPER 4(ii): Semester – IV (404: Cartography – II)
- CO1: To use Cartographic symbols and their uses: points, dots, circle, sphere, lines and area.
- CO2: Using line and bar graph for representing population, agriculture, industry and transport.
- CO3: Using Mean, Median, Mode, standard deviation and coefficient correlation with understanding
- CO4: To apply cartographic technique for representing population distribution, density, growth, land use, cropping pattern, industries and transport.
- CO5: Interpretation of topo-sheets of an area in respect of relief, drainage, settlement and communication.

GENERAL PAPER 5: Semester – V (G505: Geomorphology)
- CO1: Nature and scope of geomorphology
- CO2: Development of geomorphic idea.
- CO3: Approaches to the study of geomorphology.
- CO4: Theories of Continental drift Isostasy,
- CO5: Tetrahedral and plate tectonic.
- CO6: *Exogenic processes* Concept of gradatiuon.
- CO7: Agents and processes of gradation.
- CO8: Mountain building, classification of mountain
- CO9: Geomorphic cycle.
- CO10: Interruptions and movement of base level and its expression in landforms development.
- CO11: Hydrological cycle, runoff, evaporation and percolation, water table and underground water; drainage system and pattern.

GENERAL PAPER 5: Semester – V (506: Cartography III)
- CO1: Drainages frequency and density map.
- CO2: Interpretation of conformity and unconformity geological maps by drawing of geological sections
- CO3: Map projection by graphical, mathematical methods with suitable outline maps with their properties and uses.
  - (a) Zenithal Stereographic and orthographic
  - (b) Single cylindrical and Cylindrical equal area.
  - (c) Mercator's and Mollweide projections.
- CO4: Record book
- CO5: Viva-voce

HONOURS PAPER 5: Semester – V (505: Geomorphology)
 CO1:   To introduce to Geomorphology: Concept, nature and scope.
 CO2:   To understand relationship of geomorphology with other branches of earth sciences.
 CO3:   Geological time scale.
 CO4:   Continental Drift, Plate tectonic, earth's movement – orogenic and epeirogenic.
 CO5:   Types of fold and fault, isostasy, earthquakes and volcanoes.
 CO6:   Rocks and minerals – origin and composition of rocks, classification of rocks.
 CO7:   Weathering, formation of regolith and soils, rocks and relief.
 CO8:   Geomorphic agents and processes, erosion , transportation and deposition.
 CO9:   Mass wasting: evolution of landscape.
 CO10: Cycle of erosion: Fluvial, arid, glacial and coastal landscape.
 CO11: Applied Geomorphology: settlement, transport, land use, mining, resource evaluation, environmental and assessment.

HONOURS PAPER 5: Semester – V (506: Geography of India)
 CO1:   To understand India in the context of South and South East Asia.
 CO2:   To discuss India as a land of unity and diversity.
 CO3:   India: structure, relief, drainage, climate, vegetation and natural regions.
 CO4:   Agriculture and agricultural development planning.
 CO5:   Mineral and power resources: status of their uses and need for conservation.
 CO6:   Location of Iron and Steel Industry, textile, petrochemical, cement and forest based industries.
 CO7:   Transport and communication
 CO8:   Trade and commerce.
 CO9:   Regional division: Macro, Meso and Micro regions of India and planning.
 CO10: North East India: Structure, relief, climate, soils, natural vegetation, resource utilisation.
 CO11: Population structure and settlement patterns.
 CO12: Manipur: Structure, relief, drainage, climate, soils, natural vegetation, agriculture, minerals and power resources.
 CO13: Population, tribes and their settlement.

HONOURS PAPER 5: Semester – V (507: Cartography - III)
 CO1:   Preparation of cross and longitudinal profiles of streams.
 CO2:   Preparation of average slope map, block diagram, area height curve.
 CO3:   To interpret drainage frequency and density map.
 CO4:   Interpretation of geological map and drawing of geological sections to show the sequence and relationship of structure with relief.
 CO5:   To conduct land survey by methods: Chain tape, prismatic compass and plane table surveying.
 CO6:   Map projection: general principles and classification.
 CO7:   Map projection: properties and their uses: Zinithal orthographic, sterographic, equal area and equidistant projection.
 CO8:   Map projection: Conical Bonds, Polyconic and Cylindrical Mercators.
 CO9:   Gall's and Molleweide projection

GENERAL PAPER 6: Semester – VI (607: Regional Geography of India)
- CO:1   India in the context of South East Asia.
- CO:2   Structure and relief, drainage, climate and vegetation, population characteristics, agriculture, location and type of industries, minaeral and power resources.
- CO:3   North east India- structure and relief, climate, natural vegetation, resource utilization of forest, agriculture, mineral, power, population, tribes and settlement pattern of rural and urban.
- CO:4   Manipur- Relief features, climate soil and natural vegetation, agriculture, forest, power, transport, minerals, population, rural and urban settlements.

GENERAL PAPER 7: Semester – VI (507: Cartography-IV)
- CO1:   Surveying; Chain and Tape, Plane table and Prismatic compass.
- CO2:   Field work and field report of an area.
- CO3:   Record book
- CO4:   Viva- voce.

HONOURS PAPER 6: Semester – VI (608: Economic Geography)
- CO1:   Economic Geography: Definition, nature, scope and recent trends.
- CO2:   Economic Geography: its relation with economics and allied subjects.
- CO3:   Economic sector: Primary, secondary, tertiary and quaternary.

- CO4:   Natural resources: Renewable and non renewable, biotic and abiotic and conservation of resources.
- CO5:   Agriculture: Factors of crop production, major food crops and cash crops of the world.
- CO6:   Minerals and Industries: Classification and world distribution.
- CO7:   Industries: factors for location of industries, Iron and steel, textile, chemicals, cement, paper, ship building, small scale and cottage industries.
- CO8:   Trade and transport: Geographical factors in their development. Water, land and air transport.
- CO9:   Trade: Internal and International trade.
- CO10:   Global distribution and concentration of quaternary activities, India's position in quaternary sector, disparity between developed and developing countries.
- CO11:   Impact of globalisation and India's economy, role of multi-national companies and the rise of IT industry in India.

HONOURS PAPER 6: Semester – VI (609: World Regional Geography)
- CO1:   To understand Asia: Terrain, drainage, climate, natural vegetation and soil.
- CO2:   Spatial distribution of population and economic base of the continent.
- CO3:   Regional studies of South and South East Asia.
- CO4:   Europe: Physical, economic and demographic characteristics of the continents.
- CO5:   Regional studies of British Isles and European Union.
- CO6:   North and South America: Physical, economic and demographic set up.
- CO7:   Regional studies of USA and Brazil.
- CO8:   Australia and New Zealand: Physical, economic and demographic set up.
- CO9:   Africa: Physical, economic and demographic set up.

HONOURS PAPER 6: Semester – VI (610: Cartography – IV)

CO1: To conduct Dumpy level for preparation of road profile and contouring and theodolite for measurement of height and distances.

CO2: To comprehend Remote sensing: Orientation of aerial photograph, determination of photo scale, identification of objects from aerial photograph, visual interpretation of satellite imagery for drainage and land use mapping.

CO3: Applications of GIS and GPS.

CO4: To conduct Field work and field report of an area.

PRGRAMME   :   **BACHELOR OF ARTS**
DEPARTMENT NAME   :   **HISTORY**
PROGRAMME SPECIFIC OUTCOMES:

PSO 1: Critical analysis of historical evolutions of mankind from the past, medieval to the modern period

PSS2: understand the socio-political and economic history from ancient to the contemporary age and its significance in shaping world events

PSO3: Helps in developing practical skills in the study of historical events

PSO4: Enable the students in contextualizing geo- political and economic implications in shaping a new histroical paradigm

PSO5: Develope interest in the study of historical events and its underlying impacts

PSO6: Inculcate knowledge in reading historicasl charts, importances of monuments, and architectures,

PSO7: Appreciation of importance of archives, museums and numismatics

PSO7: Encourage the feeling of nationalism, patriotism and imbibe cultural values

COURSE OUTCOMES

I. **History Semester I**
    Course Reference - 101:
    Course Topic: Ancient India
    The present paper assist to understand –

CO1: the basic materials that are used to construct the history of Ancient India.

CO2: the importance of archeology to reconstruct the history of Ancient India.

CO3: the device or means for the construction of the history of Harappa Civilization by using only archeological findings.

CO4: about the Vedic Period that was a basic foundation of Hindu Rastra.

CO5: the emergence of new ideas or religious to alter the caste based Ancient Indian society.

II. **History Semester II**
    Course Reference - 201:
    Course Topic: History of Delhi Sultanate (1200 – 1526)

CO1: To enable the students understand the various sources of Early Indian History in reconstructing the medieval history

CO2: Aid in analyzing the rise and downfall of the Delhi sultanates and their poltical policies

CO3: Formulate ideas about the socio-cultural and administrative changes during the Sultante period

CO4: To generate an understanding of the emergence of the Vijaynagar and Bahamani kingdom and its significance

CO5: Impart socio-cultural changes that took place during the 13th and 16th century India.

CO6: Critical analyses of the development of Sifism and Bahakti Movement adn the role it playes in transforming the society in Medieval India.

III. **History Semester – III**
   Course Reference- 301
   COURSE TOPIC: History of Modern India (1600-1857)

After the completion of the course the students will understand

CO1: The European commerceial Interests – The Portuguese, The Dutch, The English & The French

CO2: British Annexation and Consolidation: Occupation of Bengal; Carnatic War; Relations with Bengal, Marathas, Sikhs

CO3: British Expansionist Policies: Subsidiary Alliances; Doctrine of Lapse

CO4: Structure and Administrative Organization of the Company: Regulating Act, 1773; Pitts India Act, 1784; Charter Act (1793, 1813, 1833&1853); Civil Services, Army & Police; Judicial Organization

CO5: Revolt of 1857: Causes, Courses and Impact

IV. **History Semester – IV**
   Course Reference- 401
   COURSE TOPIC: History of Modern Europe A.D.1789-1945

CO 1: Evaluate the socio-political and economic background of France in the Modern era for the emergence of the French Revolution

CO2: To examine the important events of the French Revolution and its subsequent effect in France and Europe

CO3: Analytical study of the Emergence of Nepolean Bonaparte and the political implications under him in Europe,

CO4: Description of the Congress ofVienna, its importance and how its transform the map of Europe

CO5 An evaluation of the leading states that emerge during the Congress of Vienna and the rise of conservatism and its effect in the revolutionary movements of 183o and 1848 of Modern Europe.

CO6: A sudy of the significance of the unification of Italy and Germany, its leading characters, and its far reaching impact not only in Europe but in the world.

CO7: Introduction to the constitutional development in Britain and its transformation form Monarchy to Democracy.

CO8: A critical and comprehensive analysis of the factors which lead to the World War I and II, and the transformation of Europe and the world due to these two wars and its signifant effects it have in the changing political scenarios leading to the present period.

V.   History Honours Semester: V

Course reference- 501 (Hon)
Course topic: HISTORY OF ANCIENT INDIA FROM 6TH CENTURY BC TO 12TH CENTURY AD
After the completion of the course students should –
CO1:   understand that was the main factor to decide the fate of the kingdom.
CO2:   learn the idea of non-violence.
CO3:   have clear idea of good governance.
CO4:   understand the idea of statecraft.
CO5:   know the offing of new era of Muslim.

Course reference- 502 (Hons)
Course topic:
The completion of the course extensively helps the students to understand-

CO1:   the essential of the source materials to construct the history of Mughal Empire ,
             establishment of Mughal Empire and Sher Shah's art of administration .
CO2:   Akber's statecraft and his place in the history of India.
CO3:   the achievements of Jahangir and Shahjahan.
C04:   Aurangzeb's religious policy, Deccan policy and the Marathas policy and ultimate results
             of these policies.
CO5:   the important organs of Mughal administration and responsible factors for the decline of
             the Mughal Empire.

Course reference- 503 (Hons)
Course topic: *History of Indian National Movement (1885 - 1947)*

CO 1:   Evaluation of the causes for the rise of Indian nationalism, new Ideas and formations of
             Indian national Congress, the difference of ideas within the Congress and the
             developmental changes and its effect
CO2:   To analyse the poltical consciousness in India and the stages of national struggle in its early
             inception
CO3:   Critical study of the rise and growth of Communalism, its adverse consequences and the
             difference that brought within the freedom movement in India
CO4:   The study of the home rule Movement and the leaders that played a key role, its demands
             and its outcomes.
CO5:   Comparison of Indian National Movement from the Pre-Gandhian to the Post gandhian era
CO6:   The historical narratives of the quit India Movement, the events associated there of, the
             implications and its signifcant changes and theimpcat of the wolrd events
CO7:   Evaluate the formation of the INA Movement, its contributions, and signifance in India and
             North East India and the outcomes In Indian national Movement
CO8:   Formulation of critical idia of partition India into two nations as well as its underlying
             outcome

VI.   **History Semester – VI**

Course Reference- 601 (Hons)
Course topic: HISTORY OF MANIPUR FROM 33A.D.1891
After the completion of the course students should
CO1:   know sources of History: Pre and Proto History of Manipur; Literary Sources and Historiography
CO2:   understand the evolution and expansion of Kingdom: Nongda Lairen Pakhangba; Kiyamba; & Khagemba
CO3:   have knowledge of Sanskritsation; Garibniwaz & Bhaigachandra
CO4:   understand the establishment of relationship with British – Treaty of 1762; 7 year Devastation; Establishment of Political Agency

Course Reference- 602 (Hons)
Course topic: South East Asia
After the completion of the course students should –
CO1:   know the different ethnic groups inhabiting in different parts of South East Asia.
CO2:   popularize South East Asia Study.
CO3:   know the nature of European colonialism.
CO4:   have clear idea of the emergence of various socio- religious and political organizations in different parts of South East Asia.
CO5:   clearly understand the South East Asian response to colonial regimes.

Course Reference- 603 (Hons)
Course topic: History of America (1766 - 1945).

CO1:   Generating knowledge about the settlements of the Europeans in America and the history of early colonization in Ameria.
CO2:   Inculcate historical ideas about the conflicting difference ofideologies among the early settlers and England, formation of the revolutionary groups in the thirteen colonies.
CO3:   Evaluate diverse events that led to the American war of Independence
CO4:   The development of the American Constitution and the framing of the constitution and the underlying principles formulated in the constitution.
CO5:   History of slavery and indenture labour in America, the conflicting ideas between the south and the north and the emergence of cvil war and defeat of south and abolition and emancipation of slavery in America, its resounding impact.
CO3:   Analyse historical process of reconstructing and rebuilding of American constitutional admendments and resettlement policies
CO4:   Understanding the emergence of America as a superpower. Its national and international polcies adopted, role in the two world wars and its consequences.
CO5:   Explain the Socio-economic and politica impact of the economic depression, political and economic reforms

PROGRAMME   :   BACHELOR OF ARTS
DEPARTMENT NAME :   MANIPURI
PROGRAMME SPECIFIC OUTCOME

 PSO. 1. Sheireng, Wareng, Grammar amasung Composition
 PSO.2. Drama, Novel, Warimacha amadi Manipuri anubad sahitya
 PSO.3. Seireng amasung Sanda Alangkar
 PSO.4. Novel amasung Warimacha
 PSO.5. Introduction to Linguistics and Manipuri Language
 PSO.6. Sahitya Neinarol (Bharat amadi Nongchup)
 PSO.7. Kavya amasung Drama
 PSO.8. Bharatki Anubad Sahitya
 PSO.9. Manipuri Sahityagi Itihas
 PSO.10. Ariba Manipuri Sahitya
 PSO.11. Manipuri Culture
 PSO.12. Folkloristics and Manipuri Folklore
 PSO.13. Manipuri Sahityagi Itihas amasung Ariba Manipuri Sahitya
 PSO.14. Manipuri Culture amasung Folklore

COURSE OUT COMES
MANIPURI (MIL), PAPER-I.

 CO-1. Sheireng karino masak takpa
 CO-2 Manipuri seirenggi liklamgi matangda khanghanba
 CO-3. Manipuri seireng khara loukhattuna neinaduna khanghanba
 CO-4. Wareng karino masak takpa
 CO-5. Manipuri warenggi liklamgi matangda khanghanba
 CO-6. Manipuri wareng khara loukhattuna neinaduna khanghanba
 CO-7. Grammar karino masak takpa
 CO-8. Grammar amadi compositiongi maramda khanghanba

MANIPURI (MIL), PAPER-II.

 CO-1. Drama karino mashak takpa.
 CO-2. Manipuri dramagi liklamgi matangda khanghanba
 CO-3. Manipuri drama 'Chengni Khujai'gi neinaduna khanghanba
 CO-4. Novel karino masak takpa
 CO-5. Manipuri novovelgi liklamgi matangda khanghanba
 CO-6. Manipuri novel 'Laman'gi matangda neinaduna khanghanba
 CO-7. Warimacha karino masak takpa
 CO-8. Manipuri warimacha khara loukhattuna neinabaduna khanghanba
 CO-9. Anubad sahitya karino masak takpa
 CO-10. Manipurida handoklaba anubadki lairik 'Kapalkundala' neinaduna khanghanba

MANIPURI(ELECTIVE), PAPER-I: SEMESTER-I

 CO-1. Manipuri seireng khara loukhattuna neinaduna khanghanba
 CO-2. 'Manipuri kavitagi sanda' karino khanghanba
 CO-3. Manipuri kavitagi sanda khudam piduna neinaduna khanghanba
 CO-4. 'Alangkar' karino masak takpa
 CO-5. Alangkar makhal khara loukhttuna neinaduna khanghanba

MANIPURI(ELECTIVE), PAPER-II, SEMESTER-II
CO-1.   Historical novel karino masak takpa
CO-2.   Manipuri historical novel 'Labangga Lata' neinaduna khanghanba
CO-3.   Samajik novel karino masak takpa
CO-4.   Manipuri Samajik novel 'Jahera' neinaduna khanghanba
CO-5.   Stream of consciousness novel karino masak takpa
CO-6.   Manipuri Stream of consciousness novel 'Imphal amasung Magi Ising Nungsitki Phibam' neinaduna khanghanba
CO-7.   Manipuri warimach khara loukhattuna neinaduna khanghanba

MANIPURI(ELECTIVE), PAPER-III, SEMESTER-III
CO-1.   Language gi definition takpa
CO-2.   Languagegi theory singgi matangda khanghanba
CO-3   Language key-properties singgi matangda khanghanba
CO-4.   Linguistics ki definition takpa
CO-5.   Descriptive, historical, comparative linguistics nachingba karino taktuna khanghanba
CO-6.   Manipuri language masak takpa
CO-7.   Manipuri languagegi maramda neinaduna lonsigi maramda khanghanba

MANIPURI(ELECTIVE), PAPER-IV, SEMESTER-IV
CO-1.   Sahitya neinarol karino masak taktuna khanghanba
CO-2.   Kabya amasung masigi makhalsinggi matangda khanghanba
CO-3.   Ras sampradaygi maramda khanghanba
CO-4.   Alangkar sampradaygi maramda khanghanba
CO-5.   Nongchup sahityagi neinaroi; Aristotle, Wordsworth, T S Eliot nachingbagi matangda neinaduna khanghanba

MANIPURI (HONOURS), PAPER-505, SEMESTER-V.
CO-1.   Mahakabaya karino masak takpa
CO-2.   Manipuri mahakabaya 'Kamba Thoibi Seireng' dagi 'San Shenba, Kang Sananaba' loukhattuna neinaduna khanghanba
CO-3.   One Act Play karino masak takpa
CO-4.   Manipuri Lila macha 'Bus Stop' amadi 'Tamnalai' neinaduna khanghanba
CO-5.   Folk Drama karino masak takpa
CO-6.   Manipuri folk drama 'Tamna' neinaduna khanghanba
CO-7.   Manipuri drama 'Judge sahepki imung' neinaduna khanghanba

MANIPURI (HONOURS), PAPER-506, SEMESTER-V.
CO-1.   Manipuri anubad sahityagi maramda khanghanba
CO-2.   Manipuri anubad sahityagi drama 'Engagi Nongma' neinaduna khanghanba
CO-3.   Manipurida handoklaba upanyas 'Shrikant' neinaduna khanghanba
CO-4.   Manipurida handoklaba warimacha khara loukhattuna neinaduna khanghanba
CO-5.   Manipurida handoklaba 'seireng' khara loukhattuna neinaduna khanghanba

MANIPURI (HONOURS), PAPER-507, SEMESTER-V.
CO-1.   Sahityagi itihas karino masak taktuna khanghanba
CO-2.   Manipuri sahityagi itihaski maramda khanghanba
CO-3.   Manipuri longi masak taktuna khanghanba

CO-4.   Manipuri sahityagi matam karamna khaigani khanghanba
CO-5.   Anganba matamgi Manipuri sahityagi masak: hiram, lon, khutee gi maramda neinaduna khanghanba
CO-6.   Mayai chanba matamgi Manipuri sahityagi masak: hiram, lon, khutee gi maramda neinaduna khanghanba
CO-7.   Anouba matamgi Manipuri sahityagi liklamgi maramda neinaduna khanghanba

MANIPURI (HONOURS), PAPER-608, SEMESTER-VI.
CO-1.   Ariba matamgi Manipuri sahitya haibasi karino khanghanba
CO-2.   Ariba matamgi Manipuri sahityagi maramda khanghanba
CO-2.   Ariba Manipuri sahityagi lairik 'Numit Kappa' neinaduna khanghanba
CO-3.   Ariba Manipuri sahityagi lairik 'Chothe Thangwai Pakhangba' neinaduna khanghanba
CO-4.   Ariba Manipuri sahityagi lairik 'Tutenglon' neinaduna khanghanba
CO-5.   Ariba Manipuri sahityagi lairik 'Chandrakriti Jilla Changba' neinaduna khanghanba

MANIPURI (HONOURS), PAPER-609, SEMESTER-VI.
CO-1.   Culture gi definition takpa
CO-2.   Manipur culturegi masak leptuna khanghanba
CO-3.   Anganba matamgi Manipurgi: lamit tumit, ngamkhei, sinpham, wayel thoudanachingba neinaduna khanghanba
CO-4.   Sel thumgi phibam, lalon itik, lambi thong, chatthok chatsingi neinaduna khanghanba
CO-5.   Manipur culturegi: laining laisol, 18-19suba chahi chagi Manipuri cultureda hinduismgi ithil neinaduna khanghanba
CO-6.   Lai haraoba, jagoi-isei, sanna-khotnabanaba: sagol kangjei, kang, yubi lakpi, hiyang nachingba neinaduna khanghanba
CO-7.   Manipuri culturegi: phijet leiteng, yumsa keisa, yekpa-khotpa, murti kalagi thabaknachingba neinaduna khanghanba.

MANIPURI (HONOURS), PAPER-610, SEMESTER-VI.
CO-1.   Folklore gi definition sing kari karino takpa
CO-2   Folkloregi: scope, nature amadi function nachingba khanghanba
CO-3.   Folkloregi theory kharagi matangda neinaduna khanghanba
CO-4.   Folkloregi field method karino neinaduna khanghanba
CO-5.   Manipuri folkloregi masak takpa
CO-6.   Manipuri folkloregi tonga tonganba masaksinggi matangda neinaduna khanghanba

MANIPURI (GENERAL), PAPER-505.
CO-1.   Manipuri sahityagi matam khaibagi maramda khanghanba
CO-2.   Anganba matamgi Manipuri sahityagi: hiram, lon, khuteegi maramda khanghanba
CO-3.   Mayai chanba matamgi Manipuri sahityagi: hiram, lon, khuteegi maramda khanghanba
CO-4.   Anouba matamgi Manipuri sahityagi liklamgi maramda khanghanba.
CO-5.   Ariba Manipuri sahitya karino khanghanba
CO-6.   Ariba Manipuri sahityagi lairik: 'Khongjom Nubi Nonggarol' amadi 'Takhel Ngamba' neinaduna khanghanba

MANIPURI (GENERAL), PAPER-606.
CO-1.   Culturegi definition amadi aspect karino khanghanba
CO-2.   Britishna Manipur lousindringeigi mamanggi: wayel, lallup, loucha pathap nachingba neinaduna khanghanba
CO-3.   Anganba matamgi Meitei laininggi maramda khanghanba
CO-4.   Folkloregi: definition, nature, scope amadi function karino khanghanba
CO-5.   Folk literature: myth, legend, folktale, folk song, proverb riddle nachingbagi maramda khanghanba

PRGRAMME   :   BACHELOR OF ARTS
DEPARTMENT NAME   :   POLITICAL SCIENCE
PROGRAMME SPECIFIC OUTCOMES:

After graduation the student will be able to

PSO 1:   Understand clearly the basic concepts of Political Science.
PSO 2:   Understand the success of democracy, depend upon the political consciousness of its people.
PSO 3:   learn the lesion of co-operation and toleration.
PSO 4:   Understand the mechanism & constitutional system of modern government.
PSO 5:   Understand the principles of Government, the domestic and foreign policies of the nation, the legislative, executive & judiciary of different countries.
PSO 6:   Understand knowledge of the state its origin member structure & function.
PSO 7:   Understand what is happening in the world around us.
PSO 8:   Helps to promote unity among the people.
PSO 9:   Develop the feeling of universal brotherhood.
PSO 10: Broaden the outlook of the citizens.

COURSE OUTCOME
1.   **Political Science Semester I**
      Course Code: 101
      Course Title: Political Theory
       After passing of the course a student will be able to:
CO 1:   Understand the theoretical expects, methods and approaches to the study of Political Science.
CO 2:   Understand the importance theory of origin of state; Organic and Mechanistic and characteristic of sovereignty.
CO 3:   Understand the importance of the concepts and kinds of Liberty Equality, Rights and duties.
CO 4:   Understand the ideas of Socialism and Communism, Liberalism and fascism.
CO 5:   Learn the issues of Behaviouralism and past Behaviouralism, political Culture and Political Socialisation.

2. **Political Science Semester II**
   Course Code: 202
   Course Title: Western Political Thought
   After passing of the course a student will be able to:
   CO 1:   Understand all the philosophical and political ideas of Plato.
   CO 2:   Understand philosophical and political ideas of Aristotle, the father of political science.
   CO 3:   Understand the political philosophy of the founder of modern political thought.
   CO 4:   Learn the ideas and philosophy of Hobbes, Lock and Rousseau.
   CO 5:   Learn the ideas of great political thinkers- Hegel, Marx and Lenin.

3. **Political Science Semester III**
   Course Code: 303
   Course Title: Indian Government and Politics
   CO1:   Understand the process and dynamics of Indian Government and Politics
   CO2:   To understand the philosophy of Indian Constitution.
   CO3:   To identify the causes, impact of British Colonial Rule.
   CO4:   To appreciate the various phases of Indian National Movement
   CO5:   To evaluate the evolution, functioning and consequence of political parties in India.
   CO6:   To identify how electoral rules and procedures in India effect election outcomes.
   CO7:   To understand the importance of National Integration.

4. **Political Science Semester IV**
   Course Code: 404
   Course Title: Comparative Government and Politics
   By the end of this course students should be able to understand -
   CO1:   The nature of Constitutional Monarchy of The United Kingdom,
   CO2:   Differentiate between Monarchy and the Crown
   CO3:   Comparison between the Constitutional monarchy and Presidential democracy.
   CO4:   Process of election procedures of U.S.A. Presidential election, check and balances, The Senate, the Congress, etc.
   CO5:   The growth Cultural Revolution in China, constitutional structure of China.
   CO6:   Students able to understand the development of constitution of Japan, Parliamentary Government and the Diet.
   CO7:   Main features of the Swiss constitution, Federal Parliament, and its composition.

5. **Political Science Honours Semester V**
   Course Code: H505
   Course Title: International Politics
   After passing the course a student will be able to
   CO1:   understand nature and scope, system and realist theories of international policies.
   CO2:   Understand the importance of power and balance of power.

CO3: Understand the importance and achievement of the Locague of Nantions & United nations Organisation.

CO 4: Understand the factors influencing foreign policy of a country & basic principles of Indian's foreign policy.

CO 5: learn the issues of Indian foreign policy and relations with its neighbors and with big power.

Course Code: H506
Course Title: Socialist Thought
After completion of the course a student will be able to:

CO 1: Understand utopian socialism and main ideas / philosophy of some Utopians, Robert Owen, Charter Fourier.

CO 2: learn the main ideas of scientific socialists Karl Marx, Engels, & Lenin.

CO 3: Understand Stalin's philosophy and though

CO 4: Understand Mac's theories.

CO 5: Have clear ideas about Anarchism and Fascism.

Course Code: H507
Course Title: Public Administration
Students should be able to

CO1: Demonstrate of Public affairs, policy development, management skill and organization theory and their application to public service.

CO2: Conduct a purposeful enquiring exploring the problem or issue a client is experiencing.

CO3: Apply critical thinking and appreciate technology for public policy analysis.

CO4: Work with and for others in ways that translate community need into policy solution and public service action to promote a just human world.

CO5: Communicate effectively for different propose

CO6: The meaning, nature, scope and importance of Public Administration and private administration, Relation and dichotomy between Politics and Public administration.

6. **Political Science Honours Semester VI**
Course Code: H608
Course Title: Government and Politics of North East India
After completion of the course a student will be able to:

CO 1: Understand the features of North East India and traditional political institutions

CO 2: Learn the relation between the North East India and the British, political status of the State and Hill areas before Independence.

CO 3: Understand Sixth Schedule of the Indian Constitution, formation of new state: Nagaland, Meghalaya, Mizoram and Arunachal Pradesh.

CO 4: Understand National and Regional political parties, their role in the politics of North East India.

CO 5: Learn relation between the centre and North East India. Importance of North Eastern Council & political movements in North East India.

Course Code: H609
Course Title: Gandhian Studies
After completion of the course a student will be able to understand:
CO1:   Origin of Gandhian philosophy, his understanding of human nature and his views on spiritualization of politics.
CO2:   Gandhi's concept of Satyagraha, nonviolence, freedom and equality.
CO3:   Gandhi's Views on state, democracy and socialism.
CO4:   Gandhi s concept of trusteeship, essentials of Gandhian economics and views on science and technology.
CO5:   Gandhi and world peace, relevance of Gandhi in modern lines

Course Code: H610
Course Title: Indian Political Thought
After completion of the course a student will be able to understand:
CO1:   Ancient philosophical traditions of India; Manu; and Kautilya.
CO2:   Raja Ram Mohan Roy; Swami Vivekananda; and Aurobindo Ghosh.
CO3:   Bal Gangadhar Tilak; Gopal Krishna Gokhale and M.N. Roy.
CO4:   Md. lqbal; Jawaharlal Nehru; and Subhashchandra Bose.
CO5:   Dr. B.R. Ambedkar and Jayprakash Narayan.

PROGRAMME   :   BACHELOR OF SCIENCE
DEPARTMENT NAME   :   BOTANY
PROGRAMME SPECIFIC OUTCOME:
PSO 1:   Virus, Bacteria and Cryptogams
PSO 2:   Gymnosperms, Angiosperms, Applied Botany, Plant Anatomy and Embryology
PSO 3:   Plant Geography, Ecology, Plant Physiology and Molecular Biology
PSO 4:   Cytogenetics, Biotechnology and Biometrics
PSO 5:   Microbial Diversity, Plant Pathology and Embryology
PSO 6:   Advance plant Taxonomy, Plant Anatomy,Embryology and Palynology.
PSO 7:   Botany Practical (based on theory papers BOT- 5 and 6)
PSO 8:   Ecology, Plant Physiology and Molecular Biology
PSO 9:   Cell Biology, Genetics, Plant Breeding, Biotechnology and Computer Application
PSO 10:   Botany Practical (based on theory papers BOT- 8 and 9)

COURSE OUTCOME:
BOTANY PAPER 1: SEMESTER – I
CO1:   Virus - General structure, Viral component, Classification, Nomenclature, Viral replication .
CO2:   Bacteria General characters, Prokaryotic cell organization, brief account of genetic recombination in bacteria, type of nutrition, autotropism and heterotropism.
CO3:   Fungi - General characters and Classification (Ainsworth), asexual and sexual Reproduction, economic importance of fungi
CO4:   Life cycles of Saprolegnia (Mastigomycota), Mucor (Zygomycota), Neurospora(Ascomycota), Puccinia(Basidiomycota), and Penicillium (Deuteromycota),

CO5:   Lichens – Thallus characters, Reproduction and economic importance

CO6 :   Plant Pathology-Concepts and Classification of plant disease, Causes of plant disease and principles of plant disease management

CO7:   Algae- General characters and Classification (Fritsch), ranges of vegetative and reproductive structure of different classes,

CO8:   Life cycles of Oscillatoria (Cynophyceae), Oedogonium (Chlorophyceae), Vaucheria (Xanthophyceae), Cyclotella (Bacillariophyceae), Ectocarpus (Phyaeophyceae)and Polysiphonia (Rhodophyceae), economic importance of algae

CO9:   Bryophyte- General characters, classification alteration of generation, range of structural organizationof gametophytes and sporophytes, methods of reproduction,

CO10:   Life cycles of Riccia, Marchantia, Anthoceros, Pellia, Porella, Sphagnum and Funaria

CO11:   Pteridophytes- General characters, classification, anatomy of sporophytes, reproductive methods,

CO12:   Life cycles of Lycopodium, Selaginella, Equisetum, Isoetes, Marsilea and Dryopteris
            Botany Practical- 1 (based on the above theory paper -1)

BOTANY PAPER 2: SEMESTER – II

CO1:   Gymnosperms and Palaeobotany: General account of Gymnosperms and classification; Morphology, Reproduction

CO2:   Life cycle of Cycas, Pinus and Gnetum. Economic importance of Gymnosperms.

CO3:   Palaeobotany: Fossil Formation and types. Geological time scale and dominant fossil flora of different ages

CO4:   Angiosperm Taxonomy:Introduction of Plant TaxonomyCO5: Importance of field work, observation, herbarium preparation.

CO6:   Concept of Species, genus and family.

CO7:   Key of Identification.

CO8:   Rules of nomenclature (validity, effectivityand priority).

CO9:   Classification systems of Linnaeus, Bentham and Hooker, Engler and prantle and Hutchinson.

CO10:   Taxonomic studies of the following Families: Ranunculaceae, Brassicaceae, Malvaceae, Fabaceae, Rosaceae, Apiaceae, Asteraceae, Solanaceae, Lamiaceae

CO11:   Applied Botany and Ethnobotany: Origin of cultivated plants Vavilov's centre of origin

CO12:   Origin, cultivation and improvement of Rice and Potato.

CO13:   History, cultivation and processing of Tea

CO14:   Characteristics and uses of Timber yielding plants: Teak and Pinus

CO15:   Medicinal plants:Cinchona, Rauwolfia and Adhatoda

CO16:   Ethnobotany: Concept, Classification and interdisciplinary approaches.
            CO17: Plant Anatomy: Cell structures, cell wall and cell inclusion.

CO18:   Organisation of apical meristem, Struucture and distribution of simple and complex tissues. Primary and secondary growth in plant.

CO19:   Anomalous growth in *Amaranthus, Mirabilis* and *Dracaena* stem
            CO20: Embryology and Palynology,:Plant embryology, Micro and mega sporogenesis

CO21:   Development of male and female gametophyates, fertilization, embryo and endosperm development.

CO22:   Palynology: Pollen and spore morphology, Aerobiology and pollen allergy

            Botany Practical- 2 (based on the above theory paper -2)

BOTANY PAPER 3: SEMESTER – III

CO1: Plant Geography-scope and importance,

CO2: Phytogeographical regions of India,

CO3: Factors affecting distribution,

CO4: Plant dispersal, Migration methods,

CO5: Endemism and Barriers of distribution

C06: Principles of Ecology : Ecosystem concept, structure and function, CO7:Ecological pyramids,

CO8: Energy flow and Mineral cycling (CNP),

CO9: Food chain, food web and trophic levels,

CO10: Structure of plant community, ecological factors (biotic and abiotic factors); CO11: Ecological adaptation of xerophytes, hydrophytes,

CO12: Ecological succession- hydrosere and xerosere

CO13: Plant Physiology: Plant water relation, its component; Absorption and CO14:Translocation of water, solutes, ascent of sap theories

CO15: Minerial nutrition,

CO16: Transpiration- significance, factors; Mechanism of stomatal opening

CO17: Growth and Development

CO18: Concept of photoperiodism and Vernalization; Photoperiodism CO19: Photosynthetic pigments, Cyclic and Non- cyclic Photophosphorylation, C_3, C_4 and CAM Pathways; Factors affecting Photosynthesis,

CO20: Respiration- aerobic, anaerobic, Factors affecting Respiration; Biological CO21: Nitrogen fixation- symbiotic and non symbiotic

CO22: Biochemistry: Chemical bond pH, buffer, structure ,

CO23: Classification and structure of biomoleculed (Carbohydrates, Lipids, Amino acids, proteins, Nucleic acids and vitamins)

CO24: Enzymes action,

CO25: Respiration- Glycolysis, Krebs cycle, electron transport systems.

CO26: Molecular Biology:

CO27: Gene organisation of prokaryotes and Eukaryotes,

CO28: Structure and physical properties of DNA and RNA ;

CO29: Biosynthesisof nucleic acids; DNA replication, RNA translation

CO30: Mechanisms of protein synthesis

Botany Practical- 3 (based on the above theory paper -3)

BOTANY PAPER 4: SEMESTER – IV

CO1: Cytology: accounts of organization and function of cell and its components : Cell wall; Plasmalemma; endosplasmic reticum; Golgi apparatus; Ribosomes;Mitochondria, Plasmids and Nucleus; Structure and Function of chromosomes. Mitosis and Meiosis- Its significance

CO2 : Genetics: Mendelism: Law of segregation and independent assortment; Back cross and test cross; Gene interaction; Gene expression;

CO3: Structure of Gene; Transfer of genetic information; transcription; translation; protein synthesis; t-RNA; Linkage ; Crossing over;

CO4: Mutation and Mutagens; Chromosome alterations- deletion, duplication,translocation, inversions;

CO5:   Variation in chromosome number- aneuploidy, polyploidy; extra nuclear inheritance; Sex Chromosome; Sex determination in plants

CO6:   Plant Breeding: Principles of Plant Breeding; Plant Breeding behavior; Sexual,: Asexual, Apomixis,

CO7:   Polyembryony; Methods of Breeding in self and cross pollinated crops; Heterosis

CO8:   Biotechnology: Basic aspects of plant tissue culture; Cellular totipotency; Differentiation and Morphogenesis;

CO9:   Genetic engineering in plant improvement; Application of plant biotechnology in medicine, agriculture and human welfare

CO10:   Biometry: Scope and Application; Collection of data. Sample and Sampling- theory and methods; Mean, Median, Mode and Standard deviation; probability; chi-square test and analysis

Botany Practical- 4 (based on the above theory paper - 4)

BSc BOTANY HONOURS SEMESTER –V PAPER 5:

CO1:   Microbial Diversity-History of microbiology, Five kingdom system of classification, Carl Woese's three Domains of living organism (Archaebactaria, Bacteria and Eukaryotes), Microbial forms Viruses (including prions and viriods), Archaebactaria,   Bacteria algae, Fungi and Protozoa- their characteristic features, Microbiology of soil, air and water

CO2:   Microbes and Human welfare- Role of microbes in industry (alcohol, antibiotics, biofertilizers and biopesticides).

CO3:   Food microbiology (Spoilage, and food preservation), Medical microbiology (Microbes as pathogenic organisms).

CO4:   Plant Pathology- History of Plant Pathology, Koch's postulates of Host pathogen interrelation, Classification of plant diseases on the basis of causal organisms and symptoms, Studies on symptoms, diseases cycles and control measures of the following diseases- Damping off of seedlings, Late blight of potato, White rust of crucifers, Powdery mildew of pea, Blast of rice, Stem rust of wheat, Leaf blight of paddy, Citrus cancer and TMV

CO4:   Plant diseases management- Plant Quarantine, Seed certification, Cultural practices Fungicide (Classification on the basis of chemical nature and mode of action), Biological control, Breeding of resistant varieties, genetically modified plants (merits and demerits), Concept of integrated pest diseases management

CO5:   Bryology and Pteridology: Bryophytes as the first land plants, evolutionary trend, Ecological and Economic importance of Bryophyte Brief account on the development of Bryology in India.Origin and evolution in Pteridophytes, Relationship of Pteridophytes with Bryophytes and Gymnosperms, Ecological and Economic importance of Pteridophytes

BSc BOTANY HONOURS SEMESTER –V PAPER 6:

CO1:   Primitive Seed plants and Palaeobotany: Concept of Progymnosperms, Diversity among Gymnosperms and their distribution in Indian sub- continent. Origin and Evolution of Gymnosperms, Salient features and life cycle of *Ginkgo, Taxus, Ephedra*.

CO2:   Fossil Algae and Fungi, Primitive land plants: Rhynia, Lepidodendron, Calamites and Sphenophyllum, Fossil Gymnosperms orders Cycadofilicales, Bennettiales and Cordaitales. Fossil Angiosperm: Palmoxylon, Enigmocarpon, Sahnianthus. Palaeobotany in the exploration of Fossil fuels.CO3: Advance plant Taxonomy: Objective, Principles and Practices of Plant Taxonomy. Methods and techniques of herbarium preparation.

	Development of Chemotaxonomy, Cytotaxonomy and Numerical .Biosystematics, Taxonomy on the web; Molecular Taxonomy : Application of DNA hybridization technique in Plant Taxonomy Importance of biological markers in Taxonomic studies. Role of Botanical survey of India and Taxonomic Literatures. Classical system of Classification : Bentham and Hooker Taxonomic studies affinities CO4: Economic importance of the following Families:*Magnoliaceae, Asteraceae,Rutaceae, Anacardiaceae, Myrtaceae, Cucurbitaceae, Dipteriocarpaceae, Polygonaceae, Moraceae, Rubiaceaae, Apocynaceae, Asclepeadaceae, Acanthaceae, Verbinaceae, Aracaceae, Scitaminae (Musaceae, Zingiberaceae, Cannaceae and Marantaceae)Orchidaceae* and *Cyperaceae*
CO5:	Plant Resources- Management and Utilization, Classification of economic plants based on the uses. Cynobacteria: *Spirulina* Origin, cultivation and improvement of Maize,Mustard, Pea and Banana.
CO6:	History, cultivation and processing of Rubber.
CO7:	Characteristics and uses of Timber yielding plants: Dipterocarpus, Phobe and Melanorrhoea.
CO8:	Medicinal plants: *Ephedra, Carthamus, Aloe vera* and *Vinca.*
CO9:	Pharmacognosy: Aim and objects, Collection and preoaration of Drugs.
CO10	Importance of Ethnobotany in genepool and germplasm conservation
CO11:	Anatomy of Angiosperm: Apical meristem and histological theories of shoot and root apices.Vascularization: Primary shoots of Monocotyledons and Dicotyledons Formation of internodes, branching pattern, monopodial and sympodial. Root- Stem transition. Cambium and its function; Formation of secondary xylem, Characteristic of growth ring, Sapwood and heartwood. Secondary Phloem, Stomata and its types.
CO12:	Anomalous growth in *Bauhinia, Bougainvillea* and *Nyctanathus*
CO13:	Plant Embryology and Palynology: Plant embryology. Microsporogium and types of Pollen tetrad. Megasporogium and types of megasporogenesis.Pollen- Pistil interaction, compatibility and incompatibility. Syngamy and triple fusion.
CO14:	Development, structure and function of endosperm .types of haustoria, Embryology and types. Development of monocot and dicot embryos. Suspensor, synergid, Polyembryony, apomixes and its role.
CO15:	Pollen productionand dispersion in space and time. . Role of Pollen in taxonomy Paleopalynology. Melissopalynology and forensic paleopalynology

BSc BOTANY HONOURS SEMESTER –V PAPER 7:

Botany Practical (based on theory papers BOT- 5 and 6)

BSc BOTANY HONOURS PAPER 8: SEMESTER –VI

CO1:	Vegetation and Natural Resources: Detailed study of the vegetationand floristic region of India- Evergreen, deciduous, mangrove forest; Natural Resources- forest resources,conservation, aforestation, soial forestry, agro forestry- timber extraction, dams and their effects; Mineral resources; water resources- floods, drought,Energy resources- renewable and non- renewable resources
CO2 :	Ecosystem and Pollution: Physical environment; biotic environment, biotic and abiotic interaction, concept of habitat and niche. Ecosystem- basic component of Ecosystem, Energy flow in Ecosystem, trophic levels
CO3:	Environmental pollution- Major pollutants- air , water and soil, pollution control measure; Climate change and Global warming- environmental revolution. Biodiversity- Concept of Biodiversity

CO4:   Photosynthesis : Absorption of water, Absorption of Minerial element,-roots as absorbing surfaces- active and passive Absorption. Physiological role of micro and macro elements- their deficiency symptoms. Phase of Growth-growth curve. Plant hormones (Auxins, Gibberellins, Ethylene, Absciic acid)- Physiological functions, senescences,, Photoperiodism, Physiology of flowering, Photomorphogenesis, Phytochromes, Physiological role

CO5:   Physiology- Significance- light reactions,Calvin cycle, Photorespiration, laws of limiting factors, Chemosynthesis- a brief account; Pentose Phosphate Pathway. Biological Nitrogen fixation mechanisms,

CO6:   Elementary knowledge of Nif, Nod, Hup genes and leghaemoglobin ; stress physiology (Principles and application)

CO6:   Biochemistry water as universal solvent. Weak interaction in aqueous system. Principles of physical chemistry(pH, bufferreaction, kinetics, thermodynamics, coligative properties), Bioenergetics,

CO7:   Enzymes and enzymes kinetics, Enzymes regulation, Isozymes,

CO8:   Respiration- Glycolysis, Krebs cycle, Fermentation, oxidative phosphorylation, ATP synthesis,

CO9:   Biosynthesis of nucleic acids and Protein synthesis

CO10:   Molecular Biology: : Gene structure, expression and regulation, Gene organisation in prokaryotes and Eukaryotes, Operon concept, Gene regulation organisation in prokaryotes and Eukaryotes , positive and negative Gene regulation, interrupted organisation in Eukaryotes, RNA Slicing, mRNA stability

CO11:   Recombinant DNA Technology; Restriction endonuclease, prokaryotic and Eukaryotic clone vectors, genomic and DNA libraries; various techniques of gene mapping and concept of DNA, fingerprinting, Polymerase chain reaction, DNA Sequencing.

CO12:   Nucleic acids: Composition of nucleic acids; DNA structure;A, B, and Z form of DNA; Denaturation and Renaturation of DNA; Chromatin structure; DNA replication and recombinations; DNA Polymerase ; different forms of RNA

BSc BOTANY HONOURS PAPER 9: SEMESTER –VI

CO1:   Cell Biology: The Cell: Historical background; Cell theory; Kingdom wise Cell size and Cell structure; comparative account of prokaryotic and Eukaryotic cell; Characteristics of Archaebactaria and Mycoplasma

CO2:   Nucleus and Ribosomes: Ultrastructure; Nuclear envelope nuclear pore complex, nuclear matrix and nucleoplasm; DNA and Histones; nucleoplasm and higher level organization; centromere and telomere. Ribosomes Structure, prokaryotic and Eukaryotic organelles;

CO3:   Ribosome and their functional significance Mitochondria and Chloroplast: origin , structure and biosynthesis ; Organelles membrane and organization of macromolecular complexes, variation in size, shape and number; Types of plastids; Organelles nuclear interactions; Organelles gene interactions;

CO4:   Structure and function of Golgi complex; endosplasmic reticum; Golgi apparatus; Lysosomes; Microbodies, Peroxisome and glyoxysomes; Cytoskeleton Cell membrane: origin , ultrastructure , chemical constituents and model of membrane organization; Roles of various membrane proteins, lipids and carbohydrates; role of ion channels and pumps in cellular transport and signalling

CO5:   Genetics: Mendel'sexperiments and Principle of inheritance; Back cross and test cross; Gene interactionsModified dihybrid ratios- Complementary, Supplementary, epistatic and duplicate factors Multiple allelism: Multiple alleles in Drossophila (eye colour), Man (blood groups), Plants (self - incompatibility) Quantitative genetic: Quantitative traits and quantitative genetic; the multiple factor hypothesis

CO6:   Plant Breeding: Types of plant reproduction: Vegetative, Sexual and Apomixis : its effect on generating and fixing genotypic variation

CO7:   Methods of plant improvement ; Pureline and mass selection ; Hybridization in self and cross pollinated crops, Introduction and acclimatization in Hybrid vigour. Mutation and Polyploidy methods of plant improvement

CO8:   Biotechnology: History, diffinition and scope; Cellular differentiation and totipotency ; Organogenesis and embryogenesis; Protoplast isolation and culture; Somatic hybridization; Clonal propagation;

CO9:   Genetic engineering of plants; Vectors of Gene delivery; Selectable markers and reporter genes; Methods of gene delivery; Agrobacterium- the natural genetic engineer; Salient achievements in crop biotechnology(with suitable examples)and prospects

CO10:   Computer application and Bioinformatics: Computer organisation programming principles, Programming language; internet and its application; communication tools-word processing, spread sheet and presentation of software; Concept of database, Application of Computer in Biological sciences ; Introduction to biostatistical analysis of data; Application of software for Botany

CO11:   Bioinformatics- introduction and asses of bioinformatics tools

BSc BOTANY HONOURS SEMESTER –VI PAPER 10:

C.O: Botany Practical (based on theory papers BOT- 8 and 9)

PROGRAMME   : **BACHELOR OF SCIENCE**
DEPARTMENT NAME   : CHEMISTRY
PROGRAMME SPECIFIC OUTCOME:

PSO 1:   INORGANIC CHEMISTRY: **Atomic structure**, **Periodic classification of elements**, **Chemical Bonding**, **Theory of quantitative and qualitative analysis**
ORGANIC CHEMISTRY: **Structure and Bonding**, **Mechanism of organic reactions**, **Cycloalkanes**, **Alkenes,Cycloalkenes,Dienes and Alkynes**
PHYSICAL CHEMISTRY: **Gaseous state-I, Gaseous state-II, Liquid state**, **Solid state**

PSO 2:   INORGANI CHEMISTRY: Acids and Bases, Oxidation and reductions, Non-aqueous solvents, Chemistry of S-block elements
ORGANIC CHEMISTRY: Stereochemistry of organic compounds, Arenes and aromaticity, Alkyl halides and aryl halides, Alcohols
PHYSICAL CHEMISTRY: Solutions, Dilute solutions, Colloids and Surface chemistry,Thermodynamics

PSO 3:   INORGANIC CHEMISTRY: Metallurgy, Chemistry of p-block elements, General properties of d-block elements, Co-ordination chemistry
ORGANIC CHEMISTRY: Phenols, Ethers and Epoxides, Aldehydes and Ketones, Organic compounds of nitrogen
PHYSICAL CHEMISTRY: Thermochemistry, Thermodynamics –II,Chemical equilibrium, Chemical kinetics

PSO 4:   INORGANIC CHEMISTRY: Chemistry of Lanthanides, Chemistry of Actinides, Chemistry of Noble gases, Hard and Soft acids and bases

ORGANI CHEMISTRY: Carboxylic acids, Carboxylic acid derivatives, Organometallic compounds, Polymers

PHYSICAL CHEMISTRY: Catalysis, Ionic equilibria-I, Ionic equilibria-II, Phase equilibria-I

PSO 5: INORGANIC CHEMISTRY: Nuclear Chemistry and Radioactivity, Chemistry of compounds of non-transition elements, Chemistry of second and third transition series, Alloy and intermetallic compounds,UV-visible spectroscopy, Infrared spectroscopy, Thermodynamic and kinetic aspects of metal complexes, Environmental Chemistry

ORGANIC CHEMISTRY: Carbohydrates, Amino acids, Peptides and Proteins, Nucleic acids, Fats, Oils, Detergents, Pericyclic reactions, Synthetic dyes, Steroids. Terpenoids, Alkaloids, Enzymes

PHYSICAL CHEMISTRY: Mathematics for chemists, Atomic structure, Quantum Chemistry-I, Photochemistry, Energetics, Specific heats of solids, Statistical thermodynamics-I, Interaction of molecules with electromagnetic radiations, Macromolecules, Conductance

PSO 6: INORGANIC CHEMISTRY: Bonding in coordination compounds, Magnetic properties of transition metal complexes, Inorganic polymers, Thermoanalytical methods, Organo-metallic chemistry, Bio-inorganic chemistry, Inorganic rings and cages, Non-stoichiometric compounds

ORGANI CHEMISTRY: Organo sulphur compounds, Elimination reactions,Organic synthesis via enolates, Heterocyclic compounds, Medicinal chemistry, Chromatography, Mass spectroscopy, Nuclear Magnetic Resonance Spectroscopy, Electron Paramagnetic Resonance Spectroscopy, Green chemistry

PHYSICAL CHEMISTRY: Computer Applications in Chemistry, Quantum chemistry-II, Spectroscopy, Symmetry and Point groups, Electrochemistry-I, Electrochemistry-II, Statistical Thermodynamics-II, Surface active agents, Chemical kinetics-II, Phase equilibria-II

COURSE OUTCOME:
CHEMISTRY PAPER 1: SEMESTER – I
CO1: Idea of de Broglie matter waves, Heisenberg, Schrodinger, Aufbau, Pauli, Hunds rule,etc.
CO2: Electronic configuration of the elements, Periodic trends in properties
CO3: Valence bond theory, VSEPR theory, Molecular orbital theory.
CO4: Principles of oxidimetry and reductimetry, iodimetry and iodometry, Gravimetric analysis, Error in quantitative analysis
CO5: Hybridization, Clathrates, Inclusion compounds, Hydrogen bonding
CO6: Basic concept of mechanism of organic reactions,.
CO7: Baeyer's strain theory, banana bonds.
CO8: Mechanism of dehydration of alcohols,Markownikoff's rule, Diels-Alder reaction.
CO9: Kinetic molecular model of gas, Law of equipartition of energy
CO10: Deviations from ideal gas behavior,van der Waals equation of state,
CO11: Nature of liquid state, Viscosity, surface tension
CO12: Nature of solid state, Miller indices, Ideas of symmetry, Bragg's law

CHEMISTRY PAPER 2: SEMESTER – II
CO1: Arrhenius concept of acids and bases,Bronsted-lowry and Lewis theory, Lux-flood theory
CO2: Electronic concept of oxidation-reduction, redox potential
CO3: Classification of solvents,reactions in liquid ammonia, liquid hydrogen fluoride,and liquid sulphur dioxide
CO4: Diagonal relationship, functions of s-block elements in biosystems

CO5:   Concept of isomerism, relative and absolute configuration, conformational isomerism
CO6:   Structure of Benzene, Huckel's rule, Aromatic electrophilic substitution
CO7:   Mechanism of nucleophilic substitution reactions of Alkyl halides and aryl halides
CO8:   Dihydric and trihydric alcohols and their chemical reactions
CO9:   Raoult's law and Henry's law, solubility of partially miscible liquids(Phenol – water, TEA – water,nicotine – water systems)
CO10:   Colligative properties, Clausis-Claypeyron equation   .
CO11:   Classification of Colloidal state, Tyndal effect, Brownian motion,Adsorption
CO12:   Intensive and extensive variables,Zeroth's law

CHEMISTRY PAPER 3: SEMESTER – III
CO1:   Minerals and ores, extraction of Li, K, Be, Sn, Sb, Bi,Cr, and Mn
CO2:   Salient features of hydrides, oxides, oxyacids, and halides of p-block elements,
CO3:   Characteristic properties of d- block elements,
CO4:   Werner's theory, isomerism of coordination compounds
CO5:   Acidic character of Phenols, Mechanisms of Fries, Claisen rearrangement, Gattermen, Hauben-Hoesch reaction ,Reimer-Tiemann reaction
CO6:   Synthesis of Ethers and Epoxides, Ziesel's method,
CO7:   Synthesis of Aldehydes and Ketones using 1,3- dithianes, Mechanisms of nucleophilic additions to carbonyl group,
CO8:   Preparation and chemical reactions of nitroalkanes and nitroarenes,
CO9:   Heats of reactions, Kirchoff's equations
CO10:   Carnot cycle ,thermodynamic scale of temperature
CO11:   Criteria of thermodynamic equilibrium,
CO12:   Rate laws, order and molecularity of reactions

CHEMISTRY PAPER 4: SEMESTER – IV
CO1:   Position of lanthanides in the periodic table and general properties
CO2:   Position of actinides in the periodic table and general properties
CO3:   Position of Noble gases in the periodic table and xenon compounds
CO4:   SHAB principle, Pearson's concept of acid and bases
CO5:   Acidity of Carboxylic acids, HVZ reactions
CO6:   Relative stability of acyl derivatives,Preparation and chemical reactions of carboxylic acid derivatives
CO7:   Organometallic compounds of Mg, Zn, Li
CO8:   Natural and synthetic polymers, Mechanism of polymerisation
CO9:   Types of catalysis, Theory of catalysis
CO10:   Electrolytes and non- electrolytes, ionic product of water and P^H,
CO11:   Solubility and solubility product, Theory of acid base indicator
CO12:   Gibbs phase rule, application to one component systems

CHEMISTRY (HONS): SEMESTER – V. CH-505 INORGANIC CHEMISTRY
CO1:   Discovery of radioactivity, Group displacement law
CO2:   Comparative studies of s - and p- block elements, Preparation and properties of bleaching powder,Portland cement and borazole
CO3:   General characteristics of second and third transition elements,
CO4:   Types of Alloys and rules for the formation of alloys
CO5:   Fundamental laws of photochemistry,elementary ideas on UV-Visible spectroscopy

CO6:   Elementary ideas on Inra-red spectroscopy
CO7:   A brief outline of thermodynamic stability of metal complexes
CO8:   Environmental segments ,atmosphere,pollutions

CHEMISTRY (HONS): SEMESTER – V. CH-506 ORGANIC CHEMISTRY
CO1:   Classification and nomenclature of Carbohydrates
CO2:   Classification,structure and stereochemistry of Amino acids,Proteins,
CO3:   Constituents of Nucleic acids
CO4:   Elementary ideas on fats,oils detergents
CO5:   Definition and classification of Pericyclic reactions
CO6:   Classifications of Dyes, electronic concepts on colour and constitution
CO7:   Occurrence, nomenclature, isolation, structure determination of Steroids
CO8:   Occurrence,nomenclature,isolation, structure determination of Terpenoids
CO9:   Definition, extraction ,isolation, structure determination of Alkaloids
CO10:   General characteristics and nomenclature of Enzymes

CHEMISTRY (HONS): SEMESTER – V. CH-507PHYSICAL CHEMISTRY
CO1:   Uncertainty in measurement, types of uncertainties,
CO2:   Bohr treatment of atomic structure and spectra of hydrogen like atoms
CO3:   Black body radiation, Quantum mechanical operators
CO4:   Laws of photochemistry
CO5:   Energetics, Nernst heat theorem
CO6:   Specific heat of solids,Dulong and Petits law
CO7:   Purpose of statistical thermodynamics
CO8:   Electromagnetic radiation and interactions of molecules with it
CO9:   Classification of polymers and properties
CO10:   Metallic and electrolytic conductors, Kohlausch law

CHEMISTRY (HONS): SEMESTER – VI. CH-608 INORGANIC CHEMISTRY
CO1:   Theory of coordination bond
CO2:   Types of magnetic behaviour, magnetic properties of transition metal complexes
CO3:   Silicates, phosphazenes, zeolites
CO4:   Basic principles of Thermogravimitric,differential thermal analysis,
CO5:   Definition,nomenclature and classification of Organometallic compounds
CO6:   Essential and non essential trace elements in biological processes
CO7:   Synthesis, structure and properties of Boron hydrides
CO8:   Non stoichiometric defects,Born-Harber cycle

CHEMISTRY (HONS): SEMESTER – VI. CH-609 ORGANIC CHEMISTRY
CO1:   Nomenclature, methods of formation and reactions of organo sulphur compounds
CO2:   Elimination reactions,E1,E2,E1cb mechanisms
CO3:   Alkylation of diethyl malonate and diethyl acetoacetate
CO4:   Introduction to condensed five and six membered heterocycles
CO5:   Drugs and Antibiotics
CO6:   Principle and applications of Chromatography
CO7:   Basic principles of Mass spectroscopy
CO8:   Qualitative and conceptual treatment of the NMR phenomenon
CO9:   Elementary principle of EPR spectroscopy

CO10:   Principles and applications of Green chemistry

CHEMISTRY (HONS): SEMESTER – VI. CH-610PHYSICAL CHEMISTRY
CO1:   Introduction to computers and its application in Chemistry
CO2:   Schrodinger wave equation and its importance
CO3:   Rotational spectra and vibrational spectra of diatomic molecules
CO4:   Symmetry operations of various point groups
CO5:   Chemical cells, reversible and irreversible cells
CO6:   Concentration cells with and without transference, liquid junction potential
CO7:   Basic postulates of Maxwell-Boltzmann distribution law and its derivation
CO8:   Classification of surfactants, Hydrophillic and Hydrophobic
CO9:   Collision theory and transition state theory of reaction rates, Lindemann mechanism
CO10:   Phase equilibria of two component system,

PROGRAMME   :   BACHELOR OF ARTS/ SCIENCE
DEPARTMENT NAME   :   MATHEMATICS

1. **Learning Outcomes**
   The Bachelor's Degree in B.A./B.Sc. (Hons) Mathematics and B.A./B.Sc. with Mathematics as a subject, is awarded to the students on the basis of knowledge, understanding, skills, attitudes, values and academic achievements sought to be acquired by learners at the end of these programmes. Hence, the learning outcomes of mathematics for these courses are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for knowledge of mathematics.

   1.1 Nature and extent of Bachelor's Degree Programme
   Mathematics is the study of quantity, structure, space and change. It has very broad scope in science, engineering and social sciences. The key areas of study in mathematics are:
   1. Calculus
   2. Algebra
   3. Geometry
   4. Differential Equations
   5. Analysis
   6. Mechanics
   7. Probability and Statistics
   8. Complex Anlysis
   9. Theory of Relavility
   10. Metric Spaces
   11. Crytography
   12. Computational Mathematics
   13. Algebra Coding Theory
   14. Integral transforms and fourier analysis

   The depth and breadth of study of individual topics depend on the nature and devotion of learners in specific mathematics programmes.
   As a part of effort to enhance employability of mathematics graduates, the courses

have been designed to include learning experiences, which offer them opportunities in various sectors of human activities. In this context, the experience of the project work in the areas of applications of mathematics has a key role.

1.2 Aims of Bachelor's degree programme in Mathematics

The overall aims of B.A./B.Sc. (Hons) Mathematics and B.A./B.Sc. with Mathematics as a subject are to

- create deep interest in learning mathematics.
- develop broad and balanced knowledge and understanding of definitions, concepts, principles and theorems.
- familiarize the students with suitable tools of mathematical analysis to handle issues and problems in mathematics and related sciences.
- enhance the ability of learners to apply the knowledge and skills acquired by them during the programme to solve specific theoretical and applied problems in mathematics.
- provide students/learners sufficient knowledge and skills enabling them to undertake further studies in mathematics and its allied areas on multiple disciplines concerned with mathematics.
- encourage the students to develop a range of generic skills helpful in employment, internships and social activities.

1.3 Key outcomes underpinning curriculum planning and development

The LOCF in Mathematics desires to propose the courses of mathematics for B.A./B.Sc. (Hons) Mathematics and B.A./B.Sc. with Mathematics as a subject, based on the expected learning outcomes and academic standards which are necessary for the graduates after completing these programmes. The committee considered and discussed the following factors seriously:

i.   Framing of syllabi
ii.   Learners attributes
iii. Qualification descriptors
iv.   Programme learning outcomes
v.   Course learning outcomes
vi.   Necessity of having elective courses
vii. Applications of mathematics
viii. Employability in banking, finance and other sectors.

2. Graduate Attributes in Mathematics

The graduate attributes in mathematics are the summation of the expected course learning outcomes mentioned with course name. Some of them are stated below.

2.1 Disciplinary knowledge:

Capability of demonstrating comprehensive knowledge of mathematics and understanding of one or more disciplines which form a part of an undergraduate programme of study.

2.2 Communications skills:

2.2.1 Ability to communicate various concepts of mathematics effectively using examples and their geometrical visualizations.

2.2.2 Ability to use mathematics as a precise language of communication in other branches of human knowledge.

2.2.3 Ability to communicate long standing unsolved problems in mathematics.

2.2.4 Ability to show the importance of mathematics as precursor to various scientific developments since the beginning of the civilization.

2.2.5 Ability to explain the development of mathematics in the civilizational context and its role as queen of all sciences.

2.3 Critical thinking and analytical reasoning:

2.3.1 Ability to employ critical thinking in understanding the concepts in every area of mathematics.

2.3.2 Ability to analyze the results and apply them in various problems appearing in different branches of mathematics.

2.4 Problem solving:

2.4.1 Capability to solve problems in computer graphics using concepts of linear algebra.

2.4.2 Capability to solve various models such as growth and decay models, radioactive decay model, drug assimilation, LCR circuits and population models using techniques of differential equations.

2.4.3 Ability to solve linear system of equations, linear programming problems and network flow problems.

2.4.4 Ability to provide new solutions using the domain knowledge of mathematics acquired during this programme.

2.5 Research-related skills:

2.5.1 Capability for inquiring about appropriate questions relating to the concepts in various fields of mathematics.

2.5.2 To know about the advances in various branches of mathematics.

2.6 Information/digital literacy:

2.6.1 Capability to use appropriate softwares to solve system of equations and differential equations.

2.6.2 Capability to understand and apply the programming concepts of C++ to mathematical investigations and problem solving.

2.7 Self-directed learning:

Ability to work independently and do in-depth study of various notions of mathematics.

2.8 Moral and ethical awareness/reasoning:

Ability to identify unethical behaviour such as fabrication, falsification or misrepresentation of data and adopting objective, unbiased and truthful actions in all aspects.

2.9 Lifelong learning:

Ability to think, acquire knowledge and skills through logical reasoning and to inculcate the habit of self-learning.

3. Qualification descriptors for B.A./B.Sc. (Hons) Mathematics and B.A./B.Sc. with Mathematics as a subject

The qualification descriptor suggests the generic outcomes and attributes to be obtained while obtaining the degree of B.A./B.Sc. (Hons) Mathematics or B.A./B.Sc. with Mathematics as a subject. The qualification descriptors indicate the academic standards on the basis of following factors:

    i.   Level of knowledge
    ii.   Understanding
    iii.   Skills
    iv.   Competencies and attitudes
    v.   Values.

These parameters are expected to be attained and demonstrated by the learners after becoming graduates in these programmes. The colleges/institutes/universities should consider the above mentioned parameters at the time of designing, approving, assessing and reviewing academic programmes containing common courses for B.A./B.Sc. (Hons) Mathematics as well as B.A./B.Sc. with Mathematics as a subject. The learning experiences and assessment procedures should be so designed that every graduate with mathematics may achieve the programme learning outcomes with equal opportunity irrespective of the class, gender, community and regions. Each graduate in mathematics should be able to:

i.   demonstrate fundamental systematic knowledge of mathematics and its applications in engineering, science, technology and mathematical sciences. It should also enhance the subject specific knowledge and help in creating jobs in various sectors.

ii.   demonstrate educational skills in areas of analysis, geometry, algebra, mechanics, differential equations etc.

iii.   apply knowledge, understanding and skills to identify the difficult/unsolved problems in mathematics and to collect the required information in possible range of sources and try to analyse and evaluate these problems using appropriate methodologies.

iv.   fulfil one's learning requirements in mathematics, drawing from a range of contemporary research works and their applications in diverse areas of mathematical sciences.

v.   apply one's disciplinary knowledge and skills in mathematics in newer domains and uncharted areas.

vi.   identify challenging problems in mathematics and obtain well-defined solutions.

vii.   exhibit subject-specific transferable knowledge in mathematics relevant to job trends and employment opportunities.

4.   Programme Learning Outcomes of B.A./B.Sc. (Hons) Mathematics and B.A./B.Sc. with Mathematics as a Subject

1. Bachelor's degree in mathematics is the culmination of in-depth knowledge of algebra, calculus, geometry, differential equations and several other branches of mathematics. This also leads to study of related areas like computer science and statistics. Thus, this programme helps learners in building a solid foundation for higher studies in mathematics.

2. The skills and knowledge gained has intrinsic beauty, which also leads to proficiency in analytical reasoning. This can be utilised in modelling and solving real life problems.

3. Students undergoing this programme learn to logically question assertions, to recognise patterns and to distinguish between essential and irrelevant aspects of problems. They also share ideas and insights while seeking and benefitting from knowledge and insight of others. This helps them to learn behave responsibly in a rapidly changing interdependent society.

4. Students completing this programme will be able to present mathematics clearly and precisely, make vague ideas precise by formulating them in the language of mathematics, describe mathematical ideas from multiple perspectives and explain fundamental concepts of mathematics to non-mathematicians.

5. Completion of this programme will also enable the learners to join teaching profession in primary and secondary schools.

6. This programme will also help students to enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

5.   Structure of B.A./B.Sc. Mathematics

5.1 Course learning outcomes

Course learning outcomes of each course in B.A./B.Sc. (Hons) Mathematics and B.A./B.Sc. with Mathematics as a subject have been enshrined in the beginning of course contents of each course.

Contents for each course

Contents of courses for B.A./B.Sc. (Hons) Mathematics

Semesters	Core Courses
I	**B-Maths Paper-101:** Algebra
II	**B-Maths Paper-202:** Calculus and Ordinary Differential Equation
III	**B-Maths Paper-303:** Vector, Geometry and Probability

IV	**B-Maths Paper -404:** Mechanics (Dynamics, Statics and Regid Dynamics)
V	**B-Maths Paper -505:** Abstract Algebra and Linear Algebra **B-Maths Paper - 506:** Analysis 1 (Real Analysis) **B-Maths Paper-507:** Numerical Analysis and Programming in C
VI	**B-Maths Paper-605:** Partail Differential Equation, Laplace Transformation and Calculus of Variation **B-Maths Paper-606:** Analysis II (Metric Spaces and Complex Analysis)
OPTIONAL PAPER (ANY ONE) Paper-603	1. Higher Mechanics 2. Fluid Mechanics 3. Theory of Probability 4. Crytography 5. Sperical Trigonometry and Astronomy 6. Computational Mathematics Laboratory 7. Special Theory of Relativity and Tensors 8. Algebraic Coding Theory

SEMESTER – I
PAPER - 101 [ALGEBRA – 1]
   Course Learning Outcomes: This course will enable the students to:

CO1:   Learn about the concepts of Fundamental Theorem of Algebra.
CO2:   Finding the A.M. and G.M. of non-negative real number and their relations.
CO3:   Employ De Moivre's theorem in a number of applications to solve numerical problems.
CO4:   Learn about the fundamental concepts of groups, subgroups, normal subgroups, isomorphism theorems, cyclic and permutation groups. Coset decomposition, Lagrange's theorem, Fermat's and Wilson's theorem.
v)   Apply various tests to determine convergence and absolute convergence of a series of real numbers

SEMESTER – II
PAPER - 202 [CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS]
   Course Learning Outcomes: This course will enable the students to:

i)   Calculate the limit and examine the continuity and understand the geometrical interpretation of differentiability.
ii)   Understand the consequences of various mean value theorems.
iii)   Draw curves in Cartesian and polar coordinate systems.
iv)   Understand conceptual variations while advancing from one variable to several variables in calculus.
v)   Inter-relationship amongst the line integral, double and triple integral formulations.
vi)   Understand the genesis of ordinary as well as partial differential equations.
vii)   Learn various techniques of getting exact solutions of certain solvable first order differential equations and linear differential equations of second order.

viii)   Know Picard's method of obtaining successive approximations of solutions of first order ordinary differential equations, passing through a given point in the plane.

ix)   Reliaze the importance of Taylor's and Maclarin's theorem.

x)   Calculate indeterminate forms L-Hospital's rule and expansion of standard function, e^x, Sin x Cos x, log (1+x), $(1 + x)^m$, $Sin^{-1} x$, $cos^{-1} x$, $tan^{-1} x$

SEMESTER – III
PAPER - 303 [VECTOR, GEOMETRY AND PROBABILITY]

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

i)   Understand the basic concepts of probability.

ii) Appreciate the importance of probability distribution of random variables and to know the notion of central tendency.

iii) Establish the joint distribution of two random variables in terms their correlation and regression.

iv) Understand central limit theorem which shows that the empirical frequencies of so many natural populations exhibit normal distribution.

v)   Application of two dimensional Geometry and three dimensional.

vi) Understand the operation on vectors and importance of Gauss, Green, Stokes theorem.

SEMESTER – IV
PAPER - 404 MECHANICS [DYNAMICS, STATICS, RIGID DYNAMICS]

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

i)   Familiarize with subject matter, which has been the single centre, to which were drawn mathematicians, physicists, astronomers and engineers together.

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

iii) Determine the centre of gravity of materialistic systems and discuss the equilibrium of a uniform cable hanging freely under its own weight.

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

v)   Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions, which were deduced by him long before the mathematical theory given by Newton.

vi)   Understand the reduction of force system in three dimensions to a resultant force acting at a base point and a resultant couple, which is independent of the choice of base of reduction.

vii)   Learn about a nul point, a nul line, and a nul plane with respect to a system of forces acting on a rigid body together with the idea of central axis.

viii)   Know the inertia constants for a rigid body and the equation of momental ellipsoid together with the idea of principal axes and principal moments of inertia and to derive Euler's equations of motion of a rigid body, moving about a point which is kept fixed.

Semester-V
B-Maths Paper-505: Abstract Algebra and Linear Algebra
 Course Learning Outcomes: This course will enable the students to:

i) Learn about the fundamental concepts of groups, subgroups, normal subgroups, isomorphism theorems, cyclic and permutation groups, automorphism groups, Cauchy's theorem, Sylow theorem, p-Sylow subgroups.
ii) Learn about the fundamental concepts of Rings and elementary properties of Rings, integral domains, division Rings, Fields and related theorem, ideals and quotient Rings, homomorphism and isomorphism of Rings, Kernel, Euclidean Rings, Polynomial Rings, Unique factorization domains.
iii) Understand the basic concepts of group actions and their applications.
iv) Recognize and use the Sylow theorems to characterize certain finite groups.
v) Learn in detail about polynomial rings, fundamental properties of finite field extensions, and classification of finite fields.

vi) Learn about properties of linear transformation and isomorphism theorems.
vii) Understand the concept of polynomials and their prime factorization.
viii) Find canonical form of linear transformations.
ix) Obtain various variants of diagonalisation of linear transformations.
x) Apply Cauchy-Schwarz inequality for deriving metric on inner product spaces and obtain orthonormal basis using Gram-Schmidt orthogonalisation.

B-Maths Paper-506: Analysis I
 Course Learning Outcomes: This course will enable the students to:
i) Understand basic properties of real number system such as least upper bound property and Order property.
ii) Realize importance of bounded, convergent, Cauchy and monotonic sequences of real numbers, find their limit superior and limit inferior.
iii) Apply various tests to determine convergence and absolute convergence of a series of real numbers.
iv) Learn about Riemann integrability of bounded functions and algebra of R-integrable functions.
v) Determine various applications of the fundamental theorem of integral calculus.
vi) Relate concepts of uniform continuity, differentiation, integration and uniform convergence.
vii) Lean about the function of several variables and concept of multiple integrals

B-Maths Paper-507
Numerical Analysis and Programming in C
 Course Learning Outcomes: This course will enable the students to:
i) Obtain numerical solutions of algebraic and transcendental equations.
ii) Find numerical solutions of system of linear equations and to check the accuracy of the solutions.

iii) Learn about various interpolating and extrapolating methods to find numerical solutions.

iv) Solve initial and boundary value problems in differential equations using numerical methods.

v) Apply various numerical methods in real life problems.

vi) Understand and apply the programming concepts of C++ for solving mathematical problems.

vii) Apply to find greatest common divisors, generate random numbers, understand Cartesian geometry and algebraic concepts through programming.

viii) Represent the outputs of programs visually in terms of well formatted text and plots.

SEMESTER – VI
B-Maths Paper-605
Partail Differential Equation, Laplace Transformation and Calculus of Variation

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

i) Learn about solution of first order linear partial differential equations using Lagrange's method.

ii) Know how to solve second order linear partial differential equations with constant coefficients.

iii) Formulate mathematical models in the form of ordinary and partial differential equations to problems arising in physical, chemical and biological disciplines.

iv) Know about piecewise continuous functions, Dirac delta function, Laplace transforms and its properties.

v) Solve ordinary differential equations using Laplace transforms.

vi) Familiarise with Fourier transforms of functions belonging to between Laplace and Fourier transforms. $L^1 \square \square \square$ class, relation

vii) Calculus of variations.

B-Maths Paper-606
Analysis II (Metric Spaces and Complex Analysis)

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

i) Learn basic facts about the cardinality of a set.

ii) Understand several standard concepts of metric spaces and their properties like openness, closedness, completeness, Bolzano$\square$Weierstrass property, compactness, and connectedness.

iii) Identify the continuity of a function defined on metric spaces and homeomorphisms.

iv) Visualize complex numbers as points of $\mathbb{R}^2$, stereographic projection of complex plane on the Riemann sphere and various geometric properties of linear fractional transformations.

v) Understand the significance of differentiability and analyticity of complex

functions leading to the Cauchy–Riemann equations.
vi) Learn the role of Cauchy–Goursat theorem and Cauchy integral formula in evaluation of contour integrals.
vii) Apply Liouville's theorem in fundamental theorem of algebra.
viii) Understand the convergence, term by term integration and differentiation of a power series.
ix) Learn Taylor and Laurent series expansions of analytic functions; classify the nature of singularities, poles and residues and application of Cauchy Residue theorem.

OPTIONAL PAPER

1. Higher Mechanics & 2. Fluid Mechanics

Course Learning Outcomes: This course will enable the students to:
i) Understand the reduction of force system in three dimensions to a resultant force acting at a base point and a resultant couple.
ii) Learn about a nul point, a nul line, and a nul plane with respect to a system of forces acting on a rigid body together with the idea of central axis.
iii) Know the inertia constants for a rigid body and the equation of momental ellipsoid together with the idea of principal axes and principal moments of inertia to derive Euler's dynamical equations.
iv) Study the kinematics and kinetics of fluid motions to understand the equation of continuity in Cartesian, cylindrical polar and spherical polar coordinates which are used to derive Euler's equations and Bernoulli's equation.
v) Deal with two-dimensional fluid motion using the complex potential and also to understand the concepts of sources, sinks, doublets and the image systems of these with regard to a line and a circle.

3. Theory of Probability

Course Learning Outcomes: This course will enable the students to:
i) Understand the basic concepts of probability.
ii) Appreciate the importance of probability distribution of random variables and to know the notion of central tendency.
iii) Establish the joint distribution of two random variables in terms their correlation and regression.
iv) Understand central limit theorem which shows that the empirical frequencies of so many natural populations exhibit normal distribution.
v) Study entropy and information theory in the framework of probabilistic models.

4. Crytography

Course Learning Outcomes: This course will enable the students to:
   i)   Understand the difference between classical and modern cryptography.
   ii)   Learn the fundamentals of cryptography, including Data and Advanced Encryption Standards (DES & AES) and RSA.
   iii) Encrypt and decrypt messages using block ciphers, sign and verify messages using well-known signature generation and verification algorithms.
   iv)   Know about the aspects of number theory which are relevant to cryptography.

5. Sperical Trigonometry and Astronomy

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

   i)   Understand the role of spherical trigonometry.
   ii)   Understand the role of three systems of celestial coordinates, rectangular coordinates, sidereal time, rising and settings of stars. Twilight motion of the sun, summer and winter solstice, different kinds of time and seasons.
   iii) Study the law of reflection, precession and nutation.
   iv)   Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions, which were deduced by him long before the mathematical theory given by Newton.

6. Computational Mathematics Laboratory

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

   i)   Understand and apply the programming concepts of C++ which is important for mathematical investigation and problem solving.
   ii)   Use mathematical libraries for computational objectives.
   iii) Represent the outputs of programs visually in terms of well formatted text and plots.

7. Special Theory of Relativity and Tensors

Course Learning Outcomes: This course will enable the students to:
   i)   Understand the basic elements of Newtonian mechanics including Michelson꞉ Morley experiment and geometrical interpretations of Lorentz transformation equations.
   ii)   Learn about length contraction, time dilation and Lorentz contraction factor.
   iii) Study 4-dimensional Minkowskian space-time and its consequences.
   iv)   Understand equations of motion as a part of relativistic mechanics.
   v)   Imbibe connections between relativistic mechanics and electromagnetism.

8. Algebraic Coding Theory

Course Learning Outcomes: This course will enable the students to:
i) Study simple ideal statistical communication models.
ii) Understand the development of codes for transmission and detection of information.
iii) Learn about the input and output of a signal via transmission channel.
iv) Study detection and correction of errors during transmission.
v) Represent a linear code by matrices - encoding and decoding.

PRGRAMME : **BACHELOR OF SCIENCE**
DEPARTMENT NAME : **PHYSICS**
PROGRAMME SPECIFIC OUTCOMES:

PSO 1 (PHY-101): This is General Course Semester I. We make the students learn, thoroughtly, the knowledge of Mechanics, which is the real foundation of all the other branches of Physics: Fundamentals of Dynamics including rotational motion, graviotational and central force motions, oscillatory motions etc. as well as special theories of relativity are thoroughtly discussed.
Laboratory works relating to the above are also done.

PSO2 (PHY-202): This is General Course Semester II. Different concepts of heat and thermodynamics, all the conepts of Light/Optics, as well as Quantum Optics are discussed.
Laboratory works relating to the above are also done.

PSO3 (PHY-303): This is General Course Semester III. Concepts of Electricity and Magnetism are studied in this course.
Laboratory works relating to the above are also done.

PSO4 (PHY404): This is General Course Semester IV. Modern Physics concerning Atomic and Nuclear Physics such as X-Ray, Atomic Spectra, Radioactivity, Nuclear Properties and Detectors, Nuclear Models and Reactions etc. are thoroughtly studied.
Laboratory works relating to the above are also done.

PSO5 (E-505): This is General Course Semester V. Mathematical Physics and all the concepts of Electronics like Basic Circuit Analysis, Semicoductors, Transistors, Amplifiers, Oscillators and Digital Circuits are taught in this course.
Laboratory works relating to the above are also done.

PSO5 (E-606): This is General Course Semester VI. Quantum Physics and general concepts of Solid State Physics are taught.
Laboratory works relating to the above are also done.

PSO5 (PHY-505): This is Semester V Honours Course 1. All the concepts of Electronics like Basic Circuit Analysis, Semicoductors, Transistors, Amplifiers, Oscillators and Digital Circuits are taught in this course.

PSO5 (PHY-506): This is Semester V Honours Course 2. All the concepts of Mathematical Physics such as Complex Variables and its Functions, Special Functions, Partial Differential Equations, Fourier Series etc are thoroughtly discussed.

PSO5 (PHY-507P):This is Semester V Honours Course 3(Practical). Laboratory/Practical studies on various experiments relating to Electronics are done.

PSO5 (PHY-608): This is Semester VI Honours Course 4. All concepts of Quantum Mechanics are taught to the students

PSO5 (PHY-609): This is Semester VI Honours Course 5. Physics of Materials like Solid State Physics, Superconductivity, and Lattice Dynamics etc. are studied thoroughtly.

PSO5 (PHY-610): This is Semester VI Honours Course 6. Laboratory/Practical studies on various experiments relating to Light/Optical Spectrum are done.

COURSE OUTCOMES (PHYSICS)

7. **Semester I**
   CO1:   Fundamentals of Dynamics.
   CO2:   Rotational Dynamics
   CO3:   Graviational and Central Force Motion
   CO4:   Oscillatory Motion
   CO5:   Special Theory of Relativity
   CO6:   Laboratory/Practical Works relating to Mechanics

8. **Semester II**
   CO1:   Thermodynamics
   CO2:   Kinetic Theory of Gases and Radiation
   CO3:   Interference and diffraction
   CO4:   Polarization
   CO5:   Elements of Quantum Optics
   CO6:   Laboratory/Practical Works relating to Thermal Physics and Optics

9. **Semester III**
   CO1:   Vector and Scalar Fields
   CO2:   Electric Field
   CO3:   Magnetic Field
   CO4:   Electromagnetic Induction
   CO5:   Laboratory/Practical Works relating to Electricity and Magnetism

10. **Semester IV**
    CO1:   Mass Spectrographs and X-Ray
    CO2:   Atomic Spectra
    CO3:   Radioactivity
    CO4:   Particle Accelerator
    CO5:   Nuclear Detectors
    CO6:   Nuclie and their Properties
    CO7:   Nuclear Models
    CO8:   Nuclear Reactions
    CO9:   Laboratory/Practical Works relating to above

11. Semester V (General)
CO1: Fourier Series and Series Solution
CO2: Network Analysis
CO3: Semiconductor Diodes
CO4: Bi-polar Junction Transistors (BJT)
CO5: Transistor Amplifiers
CO6: Oscillators
CO7: Digital Circuits
CO8: Laboratory/Practical Works relating to the above

12. Semester VI (General)
CO1: Quantum Physics
CO2: Crystal Structure
CO3: Thermal and Magnetic Properties of Solid
CO4: Free Electron Theory of Metal
CO5: Band Theory of Solids
CO6: Laboratory/Practical Works relating to above

13. Semester V (Honours 1)
CO1: Basic Circuit Analysis
CO2: Semiconductor Diodes
CO3: BI-polar Junction Transistors (BJT)
CO4: Fiel Effect Transistors (FET)
CO5: Amplifiers
CO6: Oscillators
CO7: Digital Circuits

14. Semester V (Honours 2)
CO1: Complex Variables and their Functions
CO2: Special Functions
CO3: Partial Differential Equations
CO4: Fourier Series

15. Semester V (Honours 3)   Laboratory/Practical Works

16. Semester VI (Honours 4)
CO1: Origin of Quantum Theory
CO2: Basic Postulates and Formalism
CO3: Stationary States and Energy Eigen-States
CO4: Particle in One-Dimensional Box
CO5: Linear Harmonic Oscillators
CO6: One-Dimentional Potential Barrier
CO7: Hydrogen Atom

17. Semester VI (Honours 5)
CO1: Crystal Structure
CO2: Electrical Properties of Materials
CO3: Magnetic Properties of Materials

CO4:   Lattice Dynamics
CO5:   Superconductivity
CO6:   Physics of Low Dimention
18. Semester VI (Honours 6)   Laboratory/Practical Works

PROGRAMME   :   **BACHELOR OF SCIENCE**
NAME OF THE DEPARTMENT   :   **ZOOLOGY**

PROGRAMME SPECIFIC OUTCOME

PSO1:   Knowledge and skill in the fundamentals of animal sciences, understanding the complex interactions among various living organisms

PSO2:   Identification and classification of animals, Zoogeographical regions of the world and fossil animals

PSO3:   Complex interactions among the various animals of different phyla, their distribution and their relationship with the environment

PSO4:   Environmental conservation processes and its importance, pollution control, biodiversity and protection of endangered species

PSO5:   Understand the applications of biological sciences in Apiculture, Sericulture and Aquaculture

PSO6:   Application of computer in biological sciences

PSO7:   Knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms, Genetics and its importance in human health

PSO8:   Complex evolutionary processes, adaptation and behaviour of animals

PSO9:   Biotechnology and its application for human welfare

PSO10: Knowledge of physiological processes of animals and relationship of organ systems

PSO11: Understand Developmental Biology, Histology and Biological Chemistry

PSO12: Application of knowledge and understanding of Zoology to one's own life and work; and development of empathy and love towards animals

COURSE OUTCOME
ZOOLOGY SEMESTER – I
COURSE CODE: ZOO-101
TITLE: Principles of classification, Zoogeography and Palaeozoology
   After the completion of the course students will be able to understand

CO1:   History of animal classification, Taxonomic Hierarchy, International Code of Zoological Nomenclature, Chemotaxonomy and Numerical Taxonomy, Molecular techniques in Taxonomy

CO2:   Concepts of species and their limitations.

CO3:   Zoogeographical regions of the world with their characteristic fauna.

CO4:   Characteristics of Marine Realm and its types, Barriers of migration and their significance.

CO5:   Reasons of Discontinuous distribution of animals with examples.

CO6: Trace fossils, living fossils and Dating of fossils, Methods of Fossilization and types of Fossils, Importance of fossils in understanding the process of evolution.

CO7: Geological time scale and associated fauna

COURSE CODE: ZOO-101(P)
TITLE: Practicals on Principles of Classification, Zoogeography & Palaeozoology

After the completion of the course students have practical knowledge of

CO1: Collection of specimens, recording of : locality, co-ordinates, altitude, river basin, lake ,mountain range etc., method of catch, local name, description of characters, particularly colourin fresh.Labelling/tagging of specimens and its correlation with field record book.

CO2: Narcotization, Fixation and preservation techniques-wet, dry, slide preparation

CO3: Camera-Lucida drawing of specimens.

CO4: Morphometric and meristic characters, data sheets and entry.

CO5: Description of a species. Identification using dichotomous keys

ZOOLOGY SEMESTER – II
COURSE CODE: ZOO-202
TITLE: Functional Anatomy of Non-Chordates

After the completion of the course students will be able to understand

CO1: Classification of phylum Protozoa upto orders

CO2: Structure, life history and pathogenecity of *Entamoeba histolytica, Trypanosoma gambiense, Plasmodium vivax, Plasmodium falciparum*

CO3: Different types of reproduction in *Paramecium*

CO4: Classification of phylum Porifera upto orders with distinguishing characters; Canal system in porifera

CO5: Structural organization and affinities in Coelenterata.

CO6: Life cycle and different types of parasitic adaptations found in *Fasciola hepatica* & *Taenia solium;* Life cycle, pathogenecity and prophylaxis of *Ascaris lumbricoides*

CO7: Classification of phylum Annelida upto orders with distinguishing characters

CO8: Structure and affinities of Trochophore larva, larval forms of Crustacea and Insecta, metamorphosis and social life in insects; Different types of mouthparts found in insects

CO9: Phenomenon of Torsion and detorsion in Gastropoda; Structure and affinities of Neoplina

CO10: Water Vascular system and larval forms in Echinodermata

CO11: Minor Phyla

COURSE CODE: ZOO-202(P)
TITLE: Practicals on Functional Anatomy of Non-Chordates

After the completion of the course students have practical knowledge of

CO1: Dissections of Nereis –digestive and nervous systems; Cockroach- digestive, reproductive and excretory systems; Pila –digestive and nervous systems

CO2: Identification of permanent slides of representative non-chordates

CO3: Representative non-chordate

CO4: Temporary mounting of non-chordate specimens

ZOOLOGY SEMESTER – III
COURSE CODE: ZOO-303
TITLE: Functional Anatomy of Chordata

After the completion of the course students will be able to understand

CO1: General characters of chordata and classification upto classes
CO2: Structural organization of Hemichordata, Urochordata, Cephalochordata
CO3: External feature, digestive system, respiratory system and reproductionAn account on brief concept of Petromyzon and Scoliodon
CO4: Air bladder and accessory respiratory organ of fishes, Ggeneral characters and distribution of Lungfishes
CO5: Origin and evolution; distictive characters and classification upto living orders with examples; metamorphosis and neoteny in Amphibia
CO6: Reptilia: distinctive characters and classification upto living orders
CO7: Differences between poisonous and nonpoisonous snakes, biting mechanism in snakes and Mesozoic reptiles
CO8: Origin, distinctive characters and classification of Aves upto living orders
CO9: Origin, general characters and classification of Prototheria, Metatheria and Eutheria
CO10: Skeletal, excretory and reproductive systems of rabbit
CO11: Comparative anatomy of Integumentary system and its derivatives, Digestive system and circulatory system, keletal system and nervous system and endocrine glands

COURSE CODE: ZOO-303(P)
TITLE: Practicals on Functional Anatomy of Chordata

After the completion of the course students have practical knowledge of

CO1: Dissections of Scoliodon - afferent and efferent branchial vessels; V,VII, IX and X cranial nerve; internal ear and brain (to be taken out)
CO2: Dissections of frog or toad -V, VII and X cranial nerves.
CO3: Dissections of *Calotes* - arterial, venous and urino-genital systems.
CO4: Important museum specimens
CO5: Bones of Toad or Frog - skull, lower jaw, pectoral & pelvic girdles, vertebrae
CO6: Bones of *Calotes*- skull, lower jaw, pectoral & pelvic girdles, atlas and axis.
CO&: Bones of Pigeon -lower jaw, cervical vertebrae, rib, pectoral and pelvic girdles and pygostyle. Rabbit -skull, lower jaw, pectoral and pelvic girdles

ZOOLOGY SEMESTER – IV
COURSE CODE: ZOO-404
TITLE: Biodiversity, Environmental Biology, Applied Zoology and Computer Application

After the completion of the course students will be able to understand

CO1: Concept of Biodiversity in depth, Ramsar sites, Sanctuaries and National parks of India; different types of wildlife conservation methods and its implementation
CO2: Ecosystem, different types, abiotic and biotic factors, biological cycles
CO3: Population and its general features - natality, mortality, equilibrium density, etc.; Leidig's law of minimum and Shelford's law of tolerance.

CO4: Environmental pollution and its types, sources, indicators, causes and control and prevention of pollution; Toxic effects of pesticides and industrial wastes and the methods to deal with it and Biomagnification

CO5: Economic importance of Zoology – Agriculture, Sericulture, Apiculture and Pisciculture

CO6: Computer application in Biological sciences, Bioinfonnatics, E- learning and Networking.

CO7: Programmes used in biostatistics, briefly on SPSS, Minitab and phylogenetic study

COURSE CODE: ZOO-404(P)
TITLE: Practicals on Biodiversity, Environmental Biology, Applied Zoology and Computer Application

After the completion of the course students will be able to

CO1: Study ecosystem of a pond. Identification of biotic and abiotic components.

CO2: Record turbidity, temperature and pH. Estimation of Oxygen (Winkler's method) and Carbon dioxide (phenolpthalein method) of pond water.

CO3: Study population by tagging experiment, marking, releasing & recapturing method.

CO4: Study of life history stages of Honey bee, Silk moth and fish.

CO5: Identify morphological differences among the different castes of Honey bee

ZOOLOGY SEMESTER (HONOURS) – V
COURSE CODE: ZOO-H505
TITLE: Cell Biology and Genetics

After the completion of the course students will be able to understand

CO1: Cellular organization in living organisam

CO2: Structure and function of cellular membranes and cytoplasmic organelles

CO3: Nuclear organization, Chromosomes, euchromatin and heterochromatin, chromatida and karyotyping of chromosomes

CO4: Cell regulatory mechanism, cell cycle, DNA replication, molecular expression of gene and Operon models

CO5: History of Genetics, Mendelian inheritance pattern, gene interaction, qualitative and quantitative inheritance, extra chromosomal inheritance

CO6: Linkage and gene maping, Human Genome Project, modern concept of gene, Sex determination in aminals and human

CO7: Molecular basis of mutation, chromosomal abberrations

CO8: Human genetic disorders, normal and abnormal karyotype, genetic counselling

CO9: Molecular Genetics and Tools – RFLP, RAPD, AFLP and application of RFLP in DNA fingerprinting.

ZOOLOGY SEMESTER (HONOURS) – V
COURSE CODE: ZOO-H506
TITLE: Evolution, Adaptation, Ethology, Biotechnology and Bioinstrumentation

After the completion of the course students will be able to understand

CO1: History of evolutionary thought, origin of life, Evidences of evolution, Hardy-Weinberg law and Sewall-Wright effect, role of mutation in evolution

CO2: Variation, Natural selection- directional, stabilizing and disruptive types

CO3: Isolating mechanism and their role in evolution, Speciation and Evolution of man

CO4: Structural adaptations of animals with cursorial, aquatic and volant modes of life

CO5: Adaptations of animals to deep sea, desert and cave; Adaptive radiation and adaptive convergence, colouration and mimicry in animals

CO6: Description and types of animal behavior, learning in animals, communication in insects

CO7: Pheromones abd their role, parental care in fishes, courtship behavior in fishes and birds, biological rhythm, circadian rhythm

CO8: Migration in insects, fishes and birds

CO9: History, scope, importance and types of biotechnology, Importance of microorganisms in biotechnology

CO10: Biotechnology of fermentation and bioinsecticides, animal cell culture and health care

CO11: Genetic engineering, transgenic animals, in-vitro fertilization in human and assisted reproductive technology

CO12: Different types of Microscopy, Spectrophotometry, Electrophoresis, Chromatography, Centrifugation.

ZOOLOGY SEMESTER (HONOURS) – V
COURSE CODE: ZOO-H507
TITLE: Practicals on Cell Biology and Genetics, Evolution, Adaptation, Ethology, Biotechnology and Bioinstrumentation

After the completion of the course students will have practical skills of

CO1: Preparation of temporary and permanent slides for the study of mitosis and meiosis, temporary preparation of salivary gland chromosomes of *Drosophila*

CO2: Identification of permanent slides showing autosomes and sex chromosomes of grasshoppers and mammals

CO3: Karyotyping human chromosomes, Demonstration of sex chromatin body and mitochondria

CO4: Mimicry in insects, patterns of migration of animals, types of nests of animals and parental care in animals

CO5: Alcohol fermentation, soyabean fermentation and curd making using starter culture

CO6: Preparation of standard curve of amino acid and protein, measurement of cell/spore size using micrometer, oil emulsion technique in microscopy, separation of tissue extract using centrifuge, paper and gel electrophoresis

ZOOLOGY SEMESTER (HONOURS) – VI
COURSE CODE: ZOO-H608
TITLE: Animal Physiology, Endocrinology and Immunology

After the completion of the course students will be able to understand

CO1: Animal nutrition, nutritional requirements - macro and micronutrients, digestion and absorption

CO2: Conduction and regulation of heartbeat, cardiac cycle and electrocardiogram

CO3: Composition and function of blood, blood group and Rh factor, haemoglobin and haemopoiesis, peripheral circulation, blood pressure and blood coagulation

CO4: Mechanism and control of breathing, transport of respiratory gases, oxygen dissociation curves of haemoglobin, Bohr Effect, Haldane effectand chloride shift

CO5: Physiology of urine formation, mechanism of micturition, role of kidney in water regulation, salt and acid-base balance

CO6: Ultrastructural, chemical and physiological basis of skeletal muscles, muscle contraction; molecular mechanism of muscle contraction, Cori's cycle.

CO7: Nature, origin and propagation of nerve impulse along a neuron, synapse and myo-neural junction

CO8: Integrative functions of central nervous system, functions of organs related with vision, sound perception, taste, smell and.touch and Electroencephalogram (EEG)

CO9: Endocrine glands and neurosecretory cells; Functions and hormones secreted by pineal gland, hypothalamus, pituitary gland, thyroid, thymus, parathyroid gland , islets of Langerhans, adrenal gland, testis, and ovary and hormones secreted by gastrointestinal system, kidney, placenta and heart and their functions

CO10: Immunity - innate and acquired immunity, structure and types of Immunoglobulins, antigen-antibodies reaction, mechanism of immune responses, brief idea of HIV and AIDS

ZOOLOGY SEMESTER (HONOURS) – VI
COURSE CODE: ZOO-H609
TITLE: Developmental Biology, Histology and Biochemistry

After the completion of the course students will be able to understand

CO1: Gametogenesis, fertilization and parthenogenesis in animals

CO2: Animal egg, early stages of development – patterns of cleavage, blastulation and gastrulation in frog and chick, germ layers and their derivatives and homologies, fate map and foetal membranes

CO3: Organogenesis of central nervous system, sense organs, heart and kidney, tissue interactions (inductions) in development

CO4: Metamorphosis – retrogressive and progressive, regulation of metamorphosis in Anura and Insecta; and Organizer concept

CO5: Principles of histological techniques, Microscopic anatomy of skin, stomach, intestine, pancreas, liver, lung, kidney, spinal chord, nerves, heart, arteries, veins, capillaries, lymph nodule, spleen, testis and ovary of mammal

CO6: Scope and importance biological Chemistry, Chemistry of carbohydrates, proteins, lipids and nucleic acids, enzymes, nature, classification and functions of enzymes. Co-enzymes and prosthetic groups. And Enzyme actions

CO7: Intermediary metabolism of Carbohydrates, Embden-Meyerhoff pathway, TCA cycle, Glycogenolysis and glycogenesis, gluconeogenesis, Biological oxidations with special reference to the role of the electron transport system and basic concept of Bioenergetics

CO7: Oxidation of fatty acids, fate of glycerol, ketone body formation and utilization and Interraction of carbohydrate and lipids

CO8: Metabolism of amino acids, oxidative deamination, trans-aminations, decarboxylation, enzymology of urea cycle; Fate of glucogenic and ketogenic aminoacids

CO9: Interrelationship of metabolic pathways

ZOOLOGY SEMESTER (HONOURS) – VI
COURSE CODE: ZOO-H610
TITLE: Practicals on Animal Physiology, Endocrinology, Immunology, Developmental Biology, Histology & Biological Chemistry

After the completion of the course students will have practical skills of

CO1: Demonstrating effects of isotonic, hypotonic and hypertonic solutions on erythrocytes, Counting of RBC and WBC using Haemocytometer, Estimation of haemoglobin percentage of blood sample from amphibia or mammal. Preparation of haemin crystals and Coagulation of blood

CO2: Recording of frog's heart beat. Demonstration of the effect of acetylcholine, atropine and epinephrine on the heart beat

CO3: Dissection of endocrine gland in rat Study of permanent slides: sections of pituitary gland, thyroid gland, adrenal gland, pancreas, testis and ovary

CO4: Determination of ABO and Rh factor of human blood sample

CO5: Developmental stages of frog (permanent slides, WM): cleavage, gastrula and neurula

CO6: Developmental stages of chick (permanent slides, WM): 18, 24, 36, 48 and 72 hours of incubation

CO7: Identification of permanent slides of sections of blastula and gastrula of chick and neurula and external gills of frog

CO8: Microtomy - fixation, embedding, block making, sectioning, staining and mounting of tissues

CO9: Identifying sections of oesophagus, stomach, duodenum, ileum, pancreas, lung, kidney and skin of mammal and amphibian

CO10: General test for identification of carbohydrate, lipid and protein; Separation of amino acid using paper chromatography; and Colorimetric estimation of protein from a calibration curve

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