INTERNAL QUALITY ASSURANCE CELL
PRESIDENCY COLLEGE, MOTBUNG
M**ANIPUR**

PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOME AND COURSE OUTCOME

Presidency College affiliates to Manipur University and it offers full time under graduate degree programmes in Arts and Science streams i.e. Bachelor of Arts (BA) and Bachelor of Science (BSc). Altogether there are 16 UG programmes/ courses in the college. Course duration for these UG programmes is three years which are spread into 6 semesters of 6 months duration each. Two UGC sponsored one year Career Oriented Certificate Courses were conducted since 2013-14 session to 2017-18. Besides these, short term courses are also opened from time to time.

Courses under BA provides students with a broad range of disciplinary studies with a strong focus on aspects of human values, ethics and achievements in social and behavioral aspects. The course aims to provide students a firm foundation to build a strong humanity in a civilized human culture with special inputs of knowledge in the chosen field of their courses. We keep on imparting students an understanding of the value of ethical, behavioral, independent and lifelong learning skills.

Courses under BSc require significant investment of energy and mind in the chosen science subjects. We charge the students to enhance thinking ability and experiential learning to understand the area of their choice. In addition to the enhanced career prospects students also develop valuable personal skills and fulfill prerequisite to Master their subject of interest. 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 (PO)

1. BACHELOR OF ARTS

PO1: Specific, measurable statements of what graduating / existing students should know, be able to do, believe or value after completing the program.
PO2: Students summarize Language acquisition theory and research.
PO3: Students evaluate pedagogical materials.
PO4: Students build the multidimensional personality and able to correlate Languages with social sciences.
PO5: Demonstrate proficiency in a range of techniques and media.
PO6: 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.
PO7: 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

PO1: 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.
PO2: Appreciate the role of science in society; and its personal, social and global importance; and how society influences scientific research.
PO3: To understand and analyze data (qualitatively or quantitatively) to identify patterns and relationships, identify anomalous observations, draw and justify conclusions
PO4: To recognize questions that are appropriate for scientific investigation, pose testable hypotheses, and evaluate and compare strategies for investigating hypotheses.
PO5: Understand the role of science in society; and its personal, social and global importance.

PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES

PROGRAMME : BACHELOR OF ARTS (BA)
NAME OF THE DEPARTMENT : ECONOMICS
PORGAMME SPECIFIC OUTCOME (PSO):

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.
PSOl0: 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:
CO1: The basic features of Indian economy, trends of national income and PCI, and composition national income.
CO2: The Interrelationship between natural resources, economic development and population.
CO3: Agricultural development
CO4. Industrialization since independence.
CO5. 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:
CO1. The various concept of micro-economics
CO2. Cardinal and ordinal theories of demand and concepts consumer supplies and elasticity of demand.
CO3. Maximisation of output, optimal expansion of plant, theories of cost and economies of scale.
CO4. Equilibrium of a firm under perfect completion and monopoly
CO5. Equilibrium of a firm under monopolistic competition and oligopoly.

3. **SEMESTER III**

Course Code: ECO 303

Title: Microeconomics

On completion of the course students will be able to:

CO1: understand price and employment of factors and equilibrium of factors in different markets. C02: 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: Macroeconomics

After the completion of the course a student is expected to:

CO1: Understand classical theory of income and employment. C02: 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:H5O5

Title: Public Finance

On completion of the course students will understand

CO1. The principle of maximum social advantage and rule of fiscal policy.

CO2. Technique and procedure of budgeting and the need of performance budgeting.

CO3. Various concepts of taxation.

CO4. Cause and effect of public expenditure. Source of public borrowing and their burden on the economy.

CO5. Fiscal federalism with reference to the latest FC and implication of FRBM.

Course Code: ECO H5O6

Title: Political Economy of Development

On completion of the course students are expected to understand:

CO1. The scope of the political economy and classical and Mercian political economies

CO2. The idea of feudalism as made of production and accumulation of capital, and relation between Mercian capital and industrial evolution

CO3. Characteristics of capitalism as a made of production

CO4. Political economy of globalization and structural adjustment

CO5. 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

After completion of the course a student will be able to:-

CO1.The concept of growths and development

CO2. Strategies of developments.

CO3. Policy issues relating to development

CO4. Various foreign trade policies

CO5. 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 environmentaleconomics.

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:

CO1. The importance of international trade and classical theories of foreign trade.

CO2. Modern foreign trade theory of Heckcher-Ohlin
CO3. Balance of payments accounting and equilibrium and exchange rate determination.
CO4. Benefit of free trade vs protectionism.
CO5. Relevance of world economic bodies to the trade policies of developing countries.

7. SEMESTER V GENERAL

Course Code: ECO G5O5

Title: Introduction to quantitative e methods for economic analysis

On the completion of the course students are expected to understand:
CO1. Basic concepts of mathematics.
CO2. Derivative of a function and its application in economics
CO3. Probability of an event and probability distribution.
CO4. Correlation and regression analysis
CO5. 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:
CO1. Basic concepts of political economy.
CO2. Balance and unbalance growth strategies.
CO3. The significance of public economics and the basic concepts of public economics.
CO4. The introductory ideas of environmental economics.
CO5. Classical theories of foreign trade and the idea about 3 world economic bodies.

PROGRAMME : BACHELOR OF ARTS (BA)
NAME OF THE DEPARTMENT : EDUCATION

PORGAMME SPECIFIC OUTCOME (PSO):

PSO1: Understanding the roles of philosophy and sociology in education.
PSO2: Acquiring the structure and functions of higher mental processes in teaching learning process.
PSO3: Analyze the development of education in India as well as in Manipur.
PSO4: Examine historical and current events, approaches from educational perspectives.
PSO5: Develop attitude towards evaluation and apply statistical tools.
PSO6: Suggest planning and management in education.
PSO7: Guiding, Recognition, Prevention Remedying of learning difficulties of students.
PSO8: Learn different educators' thought.

PSO9: Understanding the different stages of life and adjustment.

PSO10 Acquaint with some basic concept of research methodology and statistical analysis.

COURSE OUTCOMES

1. **Semester I**

Paper: ES:101

Title:Philosophical and Sociologic al Foundations of Education.

CO1: 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 I

Paper: ES:201

Title: Educational Psychology and Pedagogy

CO1: Definition of Psychology its relationship with Education Nature Scope and methods of educational Psychology Application 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 and 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 Ill Paper: ES:301

Title: Development of Education in India

CO1: 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 relating to 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

PROGRAMME : BACHELOR OF ARTS

NAME OF THE DEPARTMENT : ENGLISH

PROGRAMME SPECIFIC OUTCOME:

PSO1: Understand the basics of grammar, usage and effective communication and comprehend certain form of literature like short stories.
PSO2: Perspective of literary movements that existed from Old English Period to 19th Century. Familiarity with poetry as well as drama also emphasized.
PSO3: Develop keen knowledge on the development of British fiction
PSO4: Define literary theory and terms in criticism.
PSO5: Develop the knowledge of grammatical system of English language
PSO6: 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: Elective English (ESL-101)

Title: English Literature: History, Poetry and Drama (Old English to Century) After completion of this course, students will be able to

CO1: 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.
CO4: 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 (ESL-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.

C02: 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 (ESL-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 (ESL-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 (ESL-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 (ESL H-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 (ESL H-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 (ESL H-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: robe into the literary and aesthetic merits of North-East literature.

Semester VI

Course Code: English Honours Paper (ESL H-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 (ESL H-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.

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

PSO2: 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 historical paradigm

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

PSO6: Inculcate knowledge in reading historical charts, importance of monuments, and architectures,

PSO7: Appreciation of importance of archives, museums and numismatics

PSO8: Encourage the feeling of nationalism, patriotism and imbibe cultural values

COURSE OUTCOMES

I. History Semester I Course Reference HIS- 101:

Course Topic: Ancient India

The present paper assists to understand -

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

CO2: 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 Rajya.

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

II. History Semester II

Course Reference HIS- 202:

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 political 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 Bhakti Movement and the role it piayes in transforming the society in Medieval India.

III. History Semester- III Course Reference HIS- 303

COURSE TOPIC: History of Modern India (1600-1857)

After the completion of the course the students will understand

CO1: The European commercial 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&18S3); Civil Services, Army & Police; Judicial Organization

CO5: Revolt of 18S7: Causes, Courses and Impact

IV. History Semester -IV

Course Reference HIS- 404

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 of Vienna, 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 from 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 significant effects it has in the changing political scenarios leading to the present period.

V. History Honours Semester :V

Course reference HIS H- 505(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 HIS H- 506 (Hons)

On completion of the course students will 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.

CO4: 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 HIS H- 507 (Hons)

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

CO1: 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 political 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 thereof, the implications and its significant changes and the impact of the world events

CO7: Evaluate the formation of the INA Movement, its contributions, and significance in India and North East India and the outcomes In Indian national Movement

CO8: Formulation of critical idea of partition India into two nations as well as its underlying Outcome.

VI- History Semester- VI

Course Reference HIS - 608 (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- 609 (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 HIS H- 610 (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 America.

CO2: Inculcate historical ideas about the conflicting difference of

ideologies 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 evil war and defeat of south and abolition and emancipation of slavery in America, its resounding impact.

CO6: Analyse historical process of reconstructing and rebuilding of American constitutional amendments and resettlement policies

CO7: Understanding the emergence of America as a superpower. Its national and international polices adopted, role in the two world wars and its consequences.

CO8: Explain the Socio-economic and political impact of the economic depression, political and economic reforms.

PROGRAMME : BACHELOR OF ARTS (BA)
NAME OF THE DEPARTMENT : POLITICAL SCIENCE

PORGAMME SPECIFIC OUTCOME (PSO):

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: PS101**
   Course Title: Political Theory

After passing of the course a student will be able to:

CO1: Understand the theoretical expects, methods and approaches to the study of Political Science.

CO2: Understand the importance theory of origin of state; Organic and Mechanistic and characteristic of sovereignty.

CO3: Understand the importance of the concepts and kinds of Liberty Equality, Rights and duties.

CO4: Understand the ideas of Socialism and Communism, Liberalism and fascism.

CO5: Learn the issues of Behaviouralism and past Behaviouralism, political Culture and Political Socialisation.

2. Political Science Semester II Course Code: PS202

Course Title: Western Political Thought

After passing of the course a student will be able to:

CO1: Understand all the philosophical and political ideas of Plato.

CO2: Understand philosophical and political ideas of Aristotle, the father of political science.

CO3: Understand the political philosophy of the founder of modern political thought.

CO4: Learn the ideas and philosophy of Hobbes, Lock and Rousseau.

CO5: Learn the ideas of great political thinkers- Hegel, Marx and Lenin.

3. Political Science Semester III

Courses Code: PS303

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.

2. Political Science Semester

IV Course Code: PS404

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.

3. Political Science Honours Semester

V Course Code: HSOS

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.

CO4: Understand the factors influencing foreign policy of a country & basic principles of Indian's foreign policy.

CO5: learn the issues of Indian foreign policy and relations with its neighbors and with big power.

Course Code: PS H506

Course Title: Socialist Thought

After completion of the course a student will be able to:

CO1: Understand utopian socialism and main ideas / philosophy of some Utopians, Robert Owen, Charter Fourier.

CO2: learn the main ideas of scientific socialists Karl Marx, Engels, & Lenin.

CO3: Understand Stalin's philosophy and though

CO4: Understand Mac's theories.

CO5: Have clear ideas about Anarchism and Fascism.

Course Code: PS 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: PS H608
Course Title: Government and Politics of North East India

After completion of the course a student will be able to:

CO1: Understand the features of North East India and traditional political institutions

CO2: Learn the relation between the North East India and the British, political status of the State and Hill areas before Independence.

CO3: Understand Sixth Schedule of the Indian Constitution, formation of new state: Nagaland, Meghalaya, Mizoram and Arunachal Pradesh.

CO4: Understand National and Regional political parties, their role in the politics of North East India.

CO5: Learn relation between the centre and North East India. Importance of North Eastern Council & political movements in North East India.

Course Code: PS 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: PS 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. Iqbal; Jawaharlal Nehru and Subhashchandra Bose.

CO5: Dr. B.R. Ambedkar and Jayprakash Narayan.

PROGRAMME : BACHELOR OF SCIENCE

DEPARTMENT NAME : BOTANY

PROGRAMME SPECIFIC OUTCOME:

PSO1: Virus, Bacteria and Cryptogams

PSO2: Gymnosperms, Angiosperms, Applied Botany, Plant Anatomy and Embryology

PSO3: Plant Geography, Ecology, Plant Physiology and Molecular Biology

PSO4: Cytogenetics, Biotechnology and Biometrics

PSO5: Microbial Diversity, Plant Pathology and Embryology

PSO6: Advance plant Taxonomy, Plant Anatomy, Embryology and Palynology.

PSO7: Botany Practical based on theory papers BOT- 505 and BOT- 506)

PSO8: Ecology, Plant Physiology and Molecular Biology

PSO9: Cell Biology, Genetics, Plant Breeding, Biotechnology and Computer Application

PSO10: Botany Practical (based on theory papers BOT- 608 and 609).

COURSE OUTCOME:

BOTANY PAPER BOT-101: 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- Genera l characters, classification alteration of generation, range of structural organizationof gametophytes and sporophytes, methods of reproduction

COl0: 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, Selagine lla, Equisetum, lsoetes, Marsilea and Dryopteris

Botany Practical- 101 (based on the above theory paper -BOT 101)

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 Taxonomy

CO5: 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 *Amaranth us, Mirabilis* and *Dracaena* stem
CO20: Embryology and Palynology,:Piant 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
CO6: 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
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, C3 / C4 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 -BOT 303)

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, agricu lture and human welfare

COl0: Biometry: Scope and Application; Collection of data. Sample and Sampling-theory and methods; Mean, Median, Mode and Standard deviation; probability; chi-square test and ana lysis

Botany Practica l- 4 (based on the above theory paper- 4)

BSc BOTANY HONOURS SEMESTE R -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), Medica l 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

CO5: Plant diseases management- Plant Quarantine, Seed certification, Cultural practices Fungicide (Classification on the basis of chemical nature and mode of action), Biolagical control, Breeding of resistant varieties, genetically modified plants (merits and demerits), Concept of integrated pest diseases management

CO6: 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 HONOUR S 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 germ plasm 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, monopodia! 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 HONOUR S 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, social 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)

CO7: Biochemistry water as universal solvent. Weak interaction in aqueous system. Principles of physical chemistry(pH, bufferreaction, kinetics, thermodynamics, coligative properties), Bioenergetics,

CO8: Enzymes and enzymes kinetics, Enzymes regulation, lsozymes,

CO9: Respiration- Glycolysis, Krebs cycle, Fermentation, oxidative phosphorylation, ATP synthesis,

C010: Biosynthesis of nucleic acids and Protein synthesis

CO11: 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

CO12: 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.

CO13: 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 Drossophi la (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 610:

C.O: Botany Practical (based on theory papers BOT- 608 and 609)

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

PSO1: 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,Cycloalkene s,Dienes and Alkynes PHYSICAL CHEMISTRY: Gaseous state-1, Gaseous state-11, Liquid *state,* Solid state

PSO2: INORGANI CHEMISTRY: Acids and Bases, Oxidation and reductions, Non-aqueous solvents, Chemistry of $-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

PSO3: 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

PSO4: INORGANIC CHEMISTRY: Chemistry of Lanthanides, Chemistry of Actinides, Chemistry of Noble gases, Hard and Soft acids and bases.ORGAN I CHEMISTRY: Carboxylic acids, Carboxylic acid derivatives, Organometallic compounds, Polymers PHYSICAL CHEMISTRY: Catalysis, Ionic equilibria-!, Ionic equilibria-11, Phase equilibria-!

PSO5: 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- !, Photochemistry, Energetics, Specific heats of solids, Statistical thermodynamics-!, Interaction of molecules with electromagnetic radiations, Macromolecules, Conductance

PSO6: 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

ORGAN I CHEMISTRY: Organa 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-11, Spectroscopy, Symmetry and Point groups, Electrochemistry -!, Electrochemistry-11, Statistical Thermodynamics-11, Surface active agents, Chemical kinetics-11, Phase equilibria-11

COURSE OUTCOME:

CHEMISTRY PAPER 101: 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-Aider reaction.

CO9: Kinetic molecular model of gas, Law of equipartition of energy

COl0: 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 202: 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 biosystem

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-Ciaypeyron equation

CO11: Classification of Colloidal state, Tyndal effect, Brownian motion, Adsorption

CO12: Intensive and extensive variables,Zeroth's law

CHEMISTRY PAPER 303: 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 A ldehydes 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

COl0: Carnot cycle ,thermodynamic scale oftemperature

COll: Criteria of thermodynamic equilibrium,

C012: 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 S

CO4: HAB 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 pH,
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,pollut ions

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
COl0: General characteristics and nomenclature of Enzymes

CHEMISTRY (HONS):SEMESTER- V. CH-507 PHYSICAL 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
COl0: 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,E ,E2,E cb 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-610 PHYSICAL 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 Analysis
9. Theory of Relativity
10. Metric Spaces
11. Cryptography
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 inemployment, 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 appear in 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 software 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 descriptors 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

I V	**B-Maths Paper -404:** Mechanics (Dynamics,Statics and Regid Dynamics)
v	**8-Maths Paper -505:** Abstract Algebra and Linear Algebra **B-Maths Paper - 506:** Ana lysis 1(Real Analysis) **B-Maths Paper-507:** Numerical Analysis and
VI	**8-Maths Paper-605:** Partail Differential Equation,Laplace Transformation and Calculus of Variation **B-Maths Paper-606:** Analysis II (Metric Spaces and
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. Algebrai c 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.

CO5: 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',

Sin x Cos *x,* log (l+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, Kernet 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

Mathematics 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

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 class, relation

vii) Calculus of variations.

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, Balzano 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 $|R|^2$, 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 Cauchyrn Goursat theorem and Cauchy integral formula inevaluation 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. Spherical 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 MichelsoniMorley 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 :

PSO1(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.

PS05 (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.

PS05 (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.

PS05 (PH-507): 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.

PS05 (PH-508): This is Semester V Honours Course 2. All the concepts of Mathematical Physics such as Complex Variab les and its Functions, Special Functions, Partial Differential Equations, Fourier Series etc are thoroughtly discussed.

PS05 (PH-507P): This is Semester V Honours Course 3(Practical). Laboratory/Practical studies on various experiments relating to Electronics are done.

PS05 (PH-608): This is Semester VI Honours Course 4. All concepts of Quantum Mechanics are taught to the students

PS05 (PH-609): This is Semester VI Honours Course 5. Physics of Materials like Solid State Physics, Superconductivity, and Lattice Dynamics etc. are studied thoroughtly .

PS05 (PH-610): This is Semester VI Honours Course 6. Laboratory/Practical studies on various experiments relating to Light/Optical Spectrum are done.

COURSE OUTCOMES (PHYSICS)

1. **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

2. **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

3. **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

4. **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

5. **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

6. **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

7. **Semester V (Honours 505)**

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

8. **Semester V (Honours 506)**

CO1: Complex Variables and their Functions
CO2: Special Functions
CO3: Partial Differential Equations
CO4: Fourier Series

9. **Semester V (Honours 507)**

Laboratory/Practical Works

10. **Semester VI (Honours 608)**

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

11. **Semester VI (Honours 609)**

CO1: Crystal Structure
CO2: Electrical Properties of Materials
CO3: Magnetic Properties of Materials
CO4: Lattice Dynamics
CO5: Superconductivity
CO6: Physics of Low Dimention

12. **Semester VI (Honours 610)** 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-lOI(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 coloring 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 socia l 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 reproduction. An 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
COl0: Skeletal, excretory and reproductive systems of rabbit
COII: Comparative anatomy of Integumentary system and its derivatives, Digestive system and circulatory system, keletal system and nervous system and endocrine glands

COURSE CODE:Z00-303(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 *Ca/otes*- 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.
CO7: 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-H5O5

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, chromosoma l 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 V (HONOURS) -V COURSE CODE: ZOO-H5O6

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 Sewaii-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-HS07

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 effect and 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

COl0: Immunity - innate and acquired immunity, structure and types of Immunoglobulins, antigen-antibodies reaction, mechanism of immune response, 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, Glycogeno lysis and glycogenesis, gluconeogenesis, Biological oxidations with special reference to the role of the electron transport system and basic concept of Bioenergetics

C08: Oxidation of fatty acids, fate of glycerol, ketone body formation and utilization and interaction of carbohydrate and lipids

CO9: Metabolism of amino acids, oxidative deamination, trans-aminations, decarboxylation, enzymology of urea cycle; Fate of glucogenic and ketogenic amino acids

CO10: 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

COl0: 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

PROGRAMME : BACHELOR OF SCIENCE
DEPARTMENT NAME : ANTHROPOLOGY

PROGRAMME SPECIFIC OUTCOME (PSO):

PSO1: Fundamental of Anthropology
PSO2: Physical Anthropology and Practical (based on theory)
PSO3: Social and Cultural Anthropology
PSO4: Prehistoric Archaeology and Practical (based on theory)
PSO5: Physical Anthropology with Human Biology
PSO6: Prehistory Archaeology with special reference to Palaeolithic, Mesolithic, Neolithic Culture of Europe and Metal Culture of India
PSO7: Practical (based on physical and prehistory theory 505 & 506)
PSO8: Advanced and Cultural Anthropology
PSO9: Research Methodology and Applied Anthropology
PSO10: Practical and Field Study Report on Technology & Museology

COURSE OUTCOME:
ANTHROPOLOGY PAPER 1: SEMESTER – I (AN-E 101)

CO1: Definition of Anthropology; Historical Development; Scope and its main branches
CO2: Relationship of Anthropology with other disciplines. Essence of study on primitive society
CO3: Man as biological and social being position of Man in the Animal Kingdom. Human society Vs Animal society
CO4: Homo sapiens and physical characteristics resulted from adaptation to different eco – niches

ANTHROPOLOGY PAPER 2: SEM - II (AN-E 202)

CO1: Definition and scope of sub-branch physical Anthropology; its relationship with different branches of Anthropology & other fields.
CO2: Characteristics features of primate and its classification, distribution of anthropoid apes.
CO3: Human Skeleton and its changes due to assumption of erect posture – skull, vertebral column, pelvic girdle etc
CO4: Theory of Evolution like organic evolution; Lamarckism; Darwinism; Hominoid and Hominid fossils like Ramapithecus, Australopithecus and Homo erectus

CO5: Anthropology Practical

ANTHROPOLOGY PAPER 3 : SEM – III (AN-E 303)

CO1: Definition and scope of Social and Cultural Anthropology; its relationship with History, Economics, Psychology, Political Science etc

CO3: Kinship :- consanguineal & affinal; Kin group like lineage clan, phratry and moiety; Kinship behaviour – avoidance, joking relationship , deifinition of family, types of family, function, marriage deifinition, types and ways of acquiring mates

CO4: Polity, state and stateless societies; forms of Government and law; Definition of Economy Kula, Potlatch, definition of magic & religion and its characteristics. Animism, manias, totemic etc. Rites and ritual – Shaman, Priest, Divination

ANTHROPOLOGY PAPER 4 : SEM – IV (AN-E 404)

CO1: Studies on Prehistory, historical background and limitation of Prehistory

CO2: Nature and Scope of Prehistoric Archaeology

CO3: Prehistoric Archaeology and its relationship with other branches of Anthropology

CO4: Relationship with Prehistory; Protohistory and History, relationship with Prehistory and Archaeology

CO5: Relationship with other allied sciences; Geology, Palaeontology, Geography and relationship with Physics and Chemistry

CO6: Basic concepts: artifact, industry, culture, civilization and revolution (Neolithic and urban)

CO7: Geological time scale and appearance of man

CO8: Significance of Pleistocene epoch in prehistory, Pleistocene climatic conditions, glacial and pluvial

CO9: Causes and evidences : The great Ice Age (Astronomical and Plate-tectonic)

CO10: Methods of Dating : Relative dating (Stratigraphy and Fluorine test) and absolute dating (Carbon dating and Potassium Argon dating)

CO11: Tool typology and Technology: Distinguishing feature between man-made tool and naturally fragmented alleged tool

CO12: Stone tool typology, concept and classification , stone tool types and their functions

CO13: Stone tool techniques (direct, indirect, pressure, grinding & polishing) and their identifying characters, Primary and secondary flakings

CO14: Practical based on previous topic

ANTHROPOLOGY PAPER 5: SEM – V (AN-H 505)

CO1: Human Genetics & History and Development. Law of Heredity like Mendel's Principles)

CO2: Human Chromosome, Cell Division like Mitotic & Meiosis. Simple single factor inheritance in man like multiple allelism, polygenic inheritance

CO3: Different stages of life, growth and development, methods of studying and factors affecting growth

CO4: Concept of race, racial criteria based on stature, skin colour, eye , hairs, nose, face etc. Major racial groups of the world and their characteristics

ANTHROPOLOGY PAPER 5: SEM – V (AN-H 506)

CO1: Palaeolithic Culture of Europe, lower Palaeolithic (Abbevillian, Acheulian, Clactonian and Lavalloisian), Middle Palaeolithic (Mousterian)

CO2: Upper Palaeolithic (Aurignacian, Solutrean and Magdalenean)

CO3: Palaeolithic Culture of India: lower (Sohanian and Madrasian), Middle

(Nevasian), upper (Bhimbetka and Belan Valley)

CO4: Mesolithic Culture of Europe : (Azilian, Tardenoisean, Maglemoisian, Kitchen Midden)

CO5: Mesolithic Culture of India : General characteristics with reference to Langhnaj, Bagor, Terisites.

CO6: Neolithic Culture of Europe and India. General features of Neolithic revolution. Neolithic Culture of Europe (Early and late), Neolithic culture of India; Eastern groups, Southern group and Northern group

CO7: Metal Age Culture of India : Indus valley civilization – geographical extent, features (Town planning, Social life, arts and craft, religion, script) Causes of decline, Indian Megalithic Culture: Definition, typology and genera characters, iron age culture of India Iron associated with PGW, PRW and Megaliths

ANTHROPOLOGY PAPER 5: SEMESTER V (AN-H 507)

CO1: Under this (practical) portion there are two groups

a) Physical Anthropology group which carry 60 marks

b) Prehistory group :- This group carrying 40 marks

CO2: Physical Anthropology comprises of Somatometry (body measurement on living body), Serology (study of blood group), Dermatology, Human Physiology – measurement of BP & pulse rate

CO3: Drawing and description of Palaeolithic tools like scrapers, points, Baton-De-commandment etc based on the above theory of 4th sem.

ANTHROPOLOGY PAPER 6: SEMSETER VI (AN-H 608)

CO1: Meaning, factors of social change; and theories of social change. Assimilation, Acculturation socialization and cultural lag

CO2: Theories of Social and Cultural Anthropology like Evolutionism, Neo-evolutionism, Diffusionism

CO3: Ethnographic accounts of

a) The Nuer (Political organization)

b) The Purum (Kinship organization)

c) The Onge (Economy)

d) The Chin (Religion)

e) The Khasis (Inheritence)

ANTHROPOLOGY PAPER 6: SEMESTER VI (AN-H 609)

CO1: Field work tradition in Anthropology, pilot survey, participant observation, schedule and questionnaire, case study, interview, method of data collection

CO2: Statistics – universal and sample random and non-random sampling, frequency distribution, measures of central tendency, measures of dispersion

CO3: step of report, writing and its composition like introduction methodology, analysis, discussion summary, conclusion, footnotes reference, bibliography & applied

CO4: Concept and scopes of applied, action and development Anthropology

ANTHROPOLOGY PAPER 6: SEMESTER VI (AN-H 610)

CO1: Practical on Museology – deifinition and origin of museum, importance of

museum and its method of treatment of wood, metal & fabric articles

CO2: Submission of field report based on the previous AN-H 609 paper

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