JAWAHARLAL NEHRU COLLEGE

BOKO – 781123, KAMRUP (ASSAM)

RE-ACCREDITED WITH 'B++' GRADE BY NAAC

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Criteria II : Teaching- Learning And Evaluation

Department of Assamese

Course outcome :

Core course :

1st Sem:

Course name: History of the Assamese language and literature (until 1826)

Course Level : 300-399

The purpose of the course is to highlight the emergence and development of the Assamese language and literature until 1826. Students will learn about old and medieval Assamese literature such as Charyapada , Bargeet , Angkiya naat, Charit puthi , Buranji sahitya etc. as well as the characteristics of contemporary Assamese language through the paper.

2nd Sem :

Course name: History of the Assamese language and literature (from 1826 to 2000)

Course level : 300-399

The aim of the course is to make students acquainted with the history of Assamese language and literature from 1826 to 2000.Students will be able to learn about the nature of the Assamese language during the British period , literature written by Missionaries as well as Romantic and Modern literature through the paper.

3rd Sem :

Course name : Cultural studies of Assam

Course level: 300-399

The outcome of the course is enlightened on various aspects of culture and life style of Assamese people. The paper will help the students learn about the inhabitants of Assam as well as the Folk Culture , Tribal culture and Classical culture of Assam.

Department of Anthropology

2024
COURSE OUTCOME
DEPARTMENT OF ANTHROPOLOGY
J.N. COLLEGE, BOKO

Semester	Paper Code	Paper Name	Course Outcome
Semester-I	Course Level: 100 -199 (NEP-2020)	Foundation of Anthropology	1. This course will rise awareness about ethnocentrism and cultural relativism as unique aspects of the discipline. Students will understand anthropologically how and why social and cultural differences exist in the world and how such differences help us to social problems in everyday life. 2. This will provide an understanding of the essence of biological Anthropology with respect to evolution and variation. 3. Students will acquaint themselves with the prehistoric archeological dimension of human society and its evolutionary context .
Semester-II	Course Level: 100-199 (NEP-2020)	Fundamentals of Anthropology	1. Learn the approaches to understand culture and society asses the functioning of economic, political and religious institution 2. Analyzed the changing ideas of evolutionary theories and understand the mechanisms of evolution and variation. 3. Acquaint themselves with the basic methods and techniques of studying prehistoric archeology and its application in the field study. Students will also have been hands-on training in identification and drawing of tools of prehistoric period.
Semester-	ANT-HC-3016	Tribes and Peasants in India	1. The anthropological knowledge and approach to study of tribes, villages and peasantry can be gained. 2. The problems, prospects, development, and government polices for tribes, villages and

III			peasants can be achieved.
	ANT-HC-3026	Human Ecology: Biological & Cultural dimensions	1. The knowledge on human adaptation in ecology will be gained. 2. The knowledge on urbanization and industrialization in human societies will be achieved.
	ANT-HC-3036	Biological Diversity in Human Populations	1. The students will learn about markers for understanding biological diversity. 2. Classical markers use for classifying races. 3. Classification of Indian population.
	ANT-SE-3014	Tourism Anthropology	1. Students will learn about the Socio-Cultural background of developing tourism. 2. The students will learn the basics of eco-tourism and heritage tourism in the current situation.
Semester-IV	ANT-HC-4026	Theories of Culture and Society	1. The knowledge of the basic theories of culture in Anthropology can be gained. 2. The knowledge of the basic theories of society in Anthropology can be gained.
	ANT-HC-4026	Human Growth and Development	1. Students will learn about concepts related with growth and stages of growth. 2. Students will learn biocultural factors that influence growth and development. 3. Students will learn human body composition.
	ANT-HC-4036	Research Methods	1. The knowledge on formulation of research design, application of methods and techniques in data collection will be obtained. 2. The ethics of research will be understood for an effective research study.
	ANT-SE-4014	Public Health and Epidemiology	1. The students will learn different aspects of health, diseases and principles of epidemiology
	ANT-HC-5016	Human Population Genetics	1. Students will learn about mechanisms which create variation in gene frequencies. 2. Students will learn the method of assessing gene frequency variation. 3. Students will learn how ecological factors

			which help maintain gene frequencies.
Semester-V	ANT-HC-5026	Anthropology in Practice	1. The knowledge of Applied Anthropology, Action Anthropology in Development. 2. Students will gain knowledge of recent trend of Anthropology.
	ANT-HE-5016	Indian Archaeology	1. The students will be familiar with the rich prehistoric past of the country. 2. The students will understand the prehistoric foundation on which the later course of history in the country developed.
	ANT-HE-5026	Anthropology of Religion, Politics and Economy	1. The knowledge on the anthropological theories of religion, economies and political institution will be gained. 2. The knowledge on the interrelationship between religion, economies and political institution will be achieved.
Semester-VI	ANT-HC-6016	Forensic Anthropology	1. Students will learn about distinguishing human from non-human skeletal remains. 2. Students will learn about the techniques of making personal identification.
	ANT-HC-6026	Anthropology in India	1. The students will learn about racial linguistic and ethnic dimension of Indian society. 2. The students will be familiar with the anthropological situation of the country.
	ANT-HE-6016	Dissertation	1. The knowledge of conducting fieldwork by applying anthropological methods will be gained. 2. The knowledge of data analysis and writing based on the collected data will be learned.
	ANT-HE-5036	Demographic Anthropology	1. Students will learn about the basics of demography and demographic theories. 2. Students will learn about the tools used for population changes.
Semester-I	ANT-RC-1016 ANT-HG-1016	Introduction to Biological Anthropology	1. Students will learn about the genesis and development of biological Anthropology 2. Learn about the aspects from which evolution and variation is studied.
Semester-	ANT-RC-2016	Introduction to	1. The basic theoretical knowledge about

II	ANT-HG-2016	Social-Cultural Anthropology	Social and Cultural Anthropology can be achieved. 2. The knowledge of first-hand field data collection and analysis can be gained.
Semester-III	ANT-RC-3016 ANT-HG-3016	Archaeological Anthropology	1. Students will be acquainted with archaeological background of prehistoric, proto-historic and historical evolution of human culture. 2. Students will have practical understanding of prehistoric culture through tool technology and pottery technology.
Semester-IV	ANT-RC-4016 ANT-HG-4016		1. The knowledge of Applied Anthropology, Action Anthropology in Development. 2. Students will gain knowledge of recent trend of Anthropology.
Semester - V	ANT-SE-5014	Media Anthropology	1. Students will learn the theoretical basis Media Anthropology 2. Students will learn about the different aspects of audio-visual media.
	ANT-RE-5016	Anthropology of Religion, Politics and Economy	1. The knowledge on the anthropological theories of religion, economies and political institution will be gained. 2. The knowledge on the interrelationship between religion, economies and political institution will be achieved.
Semester-VI	ANT-RE-6016	Dissertation	1. The knowledge of conducting fieldwork by applying anthropological methods will be gained. 2. The knowledge of data analysis and writing based on the collected data will be learned.
	ANT-SE-6014	Museum Method	1. The students will acquire firsthand knowledge of preservation, conservation (including preventives and curative measure) of objects of Anthropological museum.

Dr. Mahananda Das

Department of Anthropology

J. N. College, Boko

Department of Botany

Department of Botany
Jawaharlal Nehru College, Boko
PROGRAMME SPECIFIC OUTCOMES (PSOs)
https://www.jncollegeboko.ac.in

At the end of the completion of FYUGP, the students able to learn of following:

PSO1	**Knowledge:** The range of plant diversity in terms of structure, function and environmental relationships, Plant classification, the role of plants in the functioning of the global ecosystem, statistics as applied to biological data, biomolecules, biotechnology and its applications, biosafety, and intellectual property rights.
PSO2	**Relationship with nature**: Appreciate nature, and become socially responsible citizens by using the acquired knowledge to help conserve environment.
PSO3	**Practical skills:** Students learn to carry out practical work, in the field and in the laboratory. They would gain practical knowledge about the following: ➢ plant morphology and anatomy. ➢ Plant identification. ➢ Vegetation analysis techniques. ➢ A range of physiochemical analyses of plant materials in the context of plant physiology and biochemistry. ➢ Analyze data using appropriate statistical methods and computer packages. ➢ Plant pathology and microbiology. ➢ Different nursery techniques.
PSO4	**Transferable skills**: ➢ Use of IT (word-processing, use of internet, statistical packages and databases). ➢ Communication of scientific ideas in writing and orally. ➢ Ability to work as part of a team.

	➢ Ability to use library resources. ➢ Career planning.
PSO5	**Research field:** Design, Conduct, and analyses experiments using appropriate techniques and tools in the field of botany, while integrating information from various disciplines within and related to botany, such as bioinformatics, nanoscience, biotechnology, forensic botany, and artificial intelligence.
PSO6	**Environment and sustainability:** Understand the impact of the plant diversity in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PSO7	**Ethics**: Apply ethical principles and commit to environmental ethics and responsibilities and norms of the biodiversity conservation.

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<u>Department of Economics</u>

Four-Year Undergraduate Programme in Economics

Department of Economics
Jawaharlal Nehru College, Boko

PROGRAMME OUTCOMES

The Four-Year Bachelor's Degree in Economics (Arts & Science) program aligned with the National Education Policy (NEP)-2020 framework is designed to make the students 'think like an economist' at the end of the program. The Programme Outcomes are as follows:

1. The program focuses on both the academic and holistic development of students to make self-reliance
2. It is designed to foster critical thinking and analytical skills and prepare students for real-world economic challenges.
3. Economics will be taught in a manner that integrates knowledge from other disciplines fostering a broader understanding of how economics intersects with society and apply economic theories and concepts to contemporary social issues as well as analysis of policies.
4. Graduates can apply economic theory and methods to address issues like poverty, unemployment, inequality, economic growth, and environmental challenges.
5. The program encourages students to engage in lifelong learning, adapting to evolving economic trends, technologies, and global challenges.

PROGRAMME SPECIFIC OUTCOMES

The program is designed to provide students a well-rounded education in Economics. The teaching of various courses in Economics will help the students to acquire in-depth knowledge and understanding of the functioning and performance of the Indian and other global economies. The students will be taught theory as well as the practical aspects of Economic Science. They would begin with fundamental concepts and then as they progress to higher semesters they would be introduced to more sophisticated and intricate concepts.

The following are general Programme Specific Outcomes of **Four-Year Undergraduate Programs *(FYUGP)* in Economic**s under the NEP-2020 framework:

1. Students will be able to understand economic vocabulary, methodologies, tools and analysis procedures.
2. Students will gain a strong foundation in microeconomics, macroeconomics, statistics, and econometrics, and learn how these concepts can be used to understand economic issues at both the national and global levels.
3. Students will be able to understand the impact of government policies and will be able to assess the consequences of the policies on the parties involved.
4. As the program along with economics contains statistics and mathematics, it enhances them to compute and assess the real situation of the economy including the size and changes of population, income pattern, and rate of development.

5. Students will develop an understanding of global economic systems, international trade, finance, and how global events impact national economies.
6. The program will help students develop the quantitative skills required to conduct economic research, interpret data, and use statistical methods to analyze economic phenomena.

Semester	Course		COURSE OUTCOMES
	Name	**Code**	
I	Introductory Economics	ECO0100104	*1. Students learn the basic ideas of microeconomics, Macroeconomics and public finance.* *2. Learn to think like an economist.* *3. Understand how the concepts of microeconomics, macroeconomics, and public finance are applied to analyze real-life situations.* 4. *Learn to evaluate economic policies in terms of coherent logical structure.*
	Rural Marketing	SEC0109003	1. *Understand the agricultural marketing system and the role of price discovery in our economic system* 2. *Understand, define, and explain value-added processing* 3. *Understand, define, and explain competition in the marketplace.* 4. *Understand, define, and explain consumer demand issues.* *5. Understand the role of information technology in rural marketing*
II	Basic Elements of Economics	ECO0200104	*1. Understand and critically evaluate the various measures of development* *2. Use and apply the relevant statistical tools to systematically examine any given economic phenomenon* *3. Describe and analyze the Indian economy in terms of its income and demographic features* *4. Understand the functioning of a financial system* *5. Relate and analyze the current events of the global and national economy*
	Farm Management	SEC0204403	*1. Familiarise the students with the fundamentals of farm management,* *2. Understand various types of farming that exist and introduce them to the recent developments.* *3. Enhance the existing knowledge of the use of statistical tools of the students and help them to use such knowledge in practical works.*

III	Intermediate Economics	ECO300104	1. *Provide sound training in micro and macroeconomic theory and elementary exposure to International Economics.* 2. *Students will also get further insights into the subjects of money, inflation and the Credit system* 3. *Develop broad conceptual frameworks that will enable students to understand the contents of real economic issues like consumer behavior, producer behavior, money, inflation, employment, International Economics, and basic theories*
	Data Analysis in Social Sciences	SEC0301003	1. *Facilitate students in grasping the foundational principles and multifaceted dimensions of select statistical methodologies employed within the research paradigm used in Economics.* 2. *Students shall engage in pragmatic exercises involving data entry, and the exposition of data through computational tools such as Microsoft Excel.* 3. *Students shall be tasked with compiling a comprehensive report on the accrued data, followed by a nuanced interpretation of the derived outcomes*

Department of Education

COURSE OUTCOMES/ OBJECTIVES

1ST SEMESTER

Course Name: PRINCIPLES OF EDUCATION Course Code: 100 –199

Learning Outcome: After going through this paper the students will be Able to know the meaning, types and sound principles of education. Students will be able to get acquainted with the concepts like different aims of education, Curriculum , Democracy, discipline , Freedom, etc. Have knowledge about different aims of education and its application in educational setting. Able to understand the democratic ideals and set up of education.

2ND SEMESTER

Course Name: EDUCATIONAL PSYCHOLOGY Course Code: 100 – 199

Learning Outcomes: After completion of this course the students will be able to understand the relationship between education and psychology. Explain the need of educational psychology in teaching learning process. Describe the nature and theories of learning and role of motivation in learning. Understand the concept of memory, forgetting, attention and interest. Understand intelligence, its theories and measurement and acquaint themselves with different types of personality and the adjustment mechanism. Understand the types of exceptional children and significance of individual differences in a classroom.

3 RD SEMESTER

Course Name: EDUCATIONAL SOCIOLOGY Course Code: 200 – 299

Learning Outcome: After completion of this paper the learner will be able to understand the concept and nature of sociology. Analyse the relationship of sociology with education. Understand the concept and nature of culture. Analyse the relationship of culture with education. Understand the concept of socialization and its processes. Explain the role of education on socialization. Understand the concept, nature and factors of social change. Explain the role of education on social change. Understand the concept and nature of social group and its types. Analyze the difference between social group and crowd.

4 TH SEMESTER

Course Name: EDUCATIONAL PHILOSOPHY Course Code: 200 – 299

Learning Outcome: After completion of this paper the learner will be able to understand the concept, nature, functions and branches of philosophy. Analyze the relationship of philosophy with science. Understand the concept, nature, scope and functions of educational philosophy. Analyze the relationship of philosophy with education.• Understand different Indian schools of philosophy. Analyse the educational implications of different Indian philosophy. Understand different Western schools of philosophy. Analyse the educational implications of different Western philosophy. Understand the philosophy of great philosophers and their contributions.

Course Name: DEVELOPMENT OF EDUCATION IN INDIA Course Code: 200 – 299

Learning Outcome: After completion of this course the learner will be able to recount the concept of Ancient Indian education system. Describe the education system in Ancient India, particularly Vedic Education. Examine the education system in Medieval India. Analyse the education system during British Period. Understand the

Educational situation during the time of Independence. Explain the recommendations and educational importance of different Education Commission and Committees in post Independent India. Analyse the National Policy on Education in different times. Accustom with the recent Educational Development in India.

Course Name: GUIDANCE AND COUNSELING Course Code: 200 – 299

Learning Outcomes: After completion of this course the students will be able to understand the concept, need and importance of Guidance and Counselling. Know the different types and approaches to Guidance and Counselling. Acquaint themselves with the organization of guidance service and school guidance clinic. Enable themselves to understand the challenges faced by the teacher as guidance worker.

Course Name: HUMAN RIGHTS, VALUE AND PEACE EDUCATION Course Code: 200 – 299

Learning Objectives: After completion of this course the learners will be able to demonstrate the ability to explain the basic concept, nature and scope of human rights. Describe the meaning, nature, principles, curriculum and teaching methods of human rights education at different levels of Education. Know the role of United Nations on human rights. Understand enforcement mechanism in India. Know the role of advocacy groups.

5 TH SEMESTER

Course Name: EDUCATIONAL TECHNOLOGY Course Code: 300 – 399

Learning Objectives: After completion of this course the learners will be able to demonstrate the ability to make the students understand the objective of educational technology in teaching learning process Acquaint the students with innovations in the field of education through technology. Make the students understand about various methods and devices of teaching. Acquaint students with levels, effectives of teaching and classroom management.

Course Name: EMERGING ISSUES IN EDUCATION Course Code: 300 – 399

Learning Outcome: After completion of this unit, students will able to- Make the students acquaint with major emerging issues national, state, and local. Acquaint the students with the various issues in education that are emerging in the recent years in the higher education system. Address the various problems and challenges of education in India at all levels.

Course Name: ENVIRONMENTAL EDUCATION Course Code: 300 – 399

Learning Outcome: On completion of this course, the students will be able to understand the concept of environment and its relation between human beings. Realise the importance of Environmental Education and learn the strategies aware people on environment. Discuss on Environmental Issues and Challenges and learn to deal effectively with environmental hazards. Evaluate the environmental status at regional and global level and acquire skills to conserve and preserve environment. Acquaint themselves with the SDGs and true causes of decline of environmental values among people.

Course Name: RESEARCH METHODOLOGY Course Code: 300 – 399 (Elective-1

Learning Outcome: After completion of this course the learner will be able to: Enable the students to understand the concept of Educational Research. Acquaint the students with the different steps of Educational Research. Develop an understanding of different types of educational research. Acquaint the students about the preparation of Research Proposal.

Course Name: DEVELOPMENTAL PSYCHOLOGY Course Code: 300 – 399 (Elective 2)

Learning Outcome: After completion of this course the learner will be able to understand the meaning, nature, scope and different methods of developmental psychology. Understand the pre-natal period of development. Know the characteristics and different developmental aspects of infancy period. Explain the parental attitude and family role in the development of infants. Know the characteristics and different developmental aspects of childhood period. Understand the role of family and school in social and personality development of childhood. Understand the meaning, characteristics and developmental tasks of adolescence. Explain the need and importance of studying adolescence. Understand the social, emotional and personality development of adolescence. Analyse the role of family, school and peers on adolescents' development.

Course Name: TEACHER EDUCATION Course Code: 300 – 399 (Elective 3)

Learning Outcome: After completion of this course the learner will be able to: Explain the Concept, Scope, Aims & Objectives and Significance of teacher education. Acquaint with the development of Teacher Education in India. Acquaint with the different organizing bodies of teacher education in India and their functions in preparation of teachers for different levels of education. Acquaint with the innovative trends and recent issues in teacher education, and be able to critically analyse the status of teacher education in Indi. Understand and conceive the qualities, responsibilities and professional ethics of teachers

Course Name: EDUCATIONAL MANAGEMENT Course Code: 300 – 399 (Elective 4)

Learning Objectives: After completion of this course the learners will be able to demonstrate the ability to develop an understanding of the basic concept of educational management. Enable the students to know about the various resources in education and their application Enable the students to understand the concept and importance of educational planning. Enable the students to know about the financial resources and financial management in education.

6 TH SEMESTER

Course Name: EDUCATIONAL MEASUREMENT AND LABORATORY PRACTICAL Course Code: 400 – 499

Learning Outcome: After completion of this course the learner will be able to: Understand the concept of measurement and evaluation in education. Acquaint the students with the general procedure of test construction and characteristics of a good test. Develop an understanding of different types of educational tests and their uses. Acquaint the students about personality test, and aptitude tests.

Course Name: EDUCATIONAL STATISTICS AND PRACTICAL Course Code: 400 – 499

Learning Outcome: After completion of this course the learner will be able to: Develop the basic concept of Statistics. Be acquainted with different statistical procedures used in Education. Develop the ability to represent educational data through graphs. Familiarize the students about the Normal Probability Curve and its applications in Education

Course Name: MENTAL HEALTH AND HYGIENE Course Code: 400 – 499

Learning Outcome: After completion of this course the learner will be able to: Acquaint with the fundamentals and development of mental health and the characteristics of a mentally healthy person. Understand the concept and importance of mental hygiene and its relationship with mental health. Acquire knowledge about the principles, factors promoting mental health and the role of home, school, and society in maintaining proper mental health. Learn the meaning and problem of adjustment and also the different adjustment mechanisms. Familiarise with the concept and issues of positive psychology, mental health of women, role of WHO and stress management. Will be able to apply the knowledge gained from this course for upliftment of one's mental health.

Course Name: GENDER STUDIES Course Code: 400 – 499

Learning Outcome: After going through this paper the students will be able to know the meaning of gender , difference between sex and gender ,types like Family, Marriage, Kinship, Religious institution, Gender Stereotype able to understand the meaning of the subject gender studies, its importance and features, different roles on the basis of gender able to get acquainted with the process of Socialization and gender biases in the School ,Family and Society have knowledge about different provisions for gender equality, able to apply gender sensitive approach.

Department of Geography

Program Outcome of the Four-Year Undergraduate Programme (FYUGP)

1. **The students can get to understand and know about the various sub disciplines of the geography in a detailed manner which will help them to develop and think about various phenomena in a spatial manner.**

2. **The students after completing the FYUGP can straightly join the Research and Development learning as the four years undergraduate programme enables the student to have an experience of research at undergraduate stage.**

3. **The multiple entry and exit option allow the student to pursue their career as per their convenience.**

Course outcome of the Four-Year Undergraduate Programme (FYUGP)

1. **Students will understand the evolution, concept, scope and branches of Physical Geography and its interdisciplinary nature.**

2. **Students can assess the impact of environment on man and its activities on environment in various global contexts**

3. **Students will be acquainted with various spatial concepts such as spatial diffusion, spatial concentration, concept of location and space etc.**

4. Students will have detail knowledge on various aspects of India such as physical and cultural aspect.

5. Students will get to know about various techniques used in the field of map making which is crucial for a geographer.

Department of Mathematics

FOUR YEAR UNDERGRADUATE PROGRAMME

SUBJECT: MATHEMATICS

SEMESTER-I
Classical Algebra
Total Marks: 100 (Theory 80, Internal Assessment 20)
No. of Credits: 4

Base syllabus: MAT-HG-2016/MAT-RC-2016: Algebra (UG CBCS)

Course Level: 100-199

No. of Contact classes: 60

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Prerequisites: Mathematics in 10+2 or equivalent standard.

Course Objectives: The primary objective of this course is to introduce the basic tools of complex numbers, theory of equations, matrices and matrix method of solution of homogeneous linear equations up to four variables.

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

- Employ De Moivre's theorem in a number of applications to solve numerical problems.
- Learn the basic concepts of exponential, logarithmic and hyperbolic functions of complex numbers.
- Learn how to find the nature of the roots of a given polynomial equation by Descartes' rule , also learn about symmetric functions of the roots for cubic and biquadratic equations.
- Learn how to solve cubic and biquadratic equations.
- Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix. Finding inverse and rank of a matrix.

SEMESTER-II
Calculus
Total Marks: 100 (Theory 80, Internal Assessment 20)
No. of Credits: 4
Each unit carries equal credit

Base syllabus: MAT-HG-1016/ MAT-RC-1016: Calculus (UG CBCS)
Course Level: 100-199
No. of Contact classes: 60
No. of Non-Contact classes: 0
Prerequisites: Class XII Level Mathematics

Course Objectives: Calculus is referred as 'Mathematics of change' and is concerned with describing the precise way in which changes in one variable relate to the changes in another. Through this course, students can understand the quantitative change in the behaviour of the variables and apply them on the problems related to the environment.

Course Learning Outcomes: The students who take this course will be able to:

- Understand continuity and differentiability in terms of limits.

Understand the importance of mean value theorems.

Describe asymptotic behavior in terms of limits involving infinity.

SEMESTER III

Ordinary Differential Equations

Total Marks: 100 (Theory 80, Internal Assessment 20)

No. of Credits: 4

Each unit carries equal credit

Base syllabus: MAT-HG-3016/MAT-RC-3016: Differential Equations (UG CBCS)

Course Level: 200-299

No. of Contact classes: 60

No. of Non-Contact classes: 0

Prerequisites: Class XII Mathematics

Course Objectives: The main objective of this course is to introduce the students to the exciting world of differential equations and their solutions methods.

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

- Learn basics of 1^{st} order ordinary differential equations and 2^{nd} order linear differential equations
- Learn different techniques for solving the differential equations

Unit 1: First Order Ordinary Differential Equations

Classification of differential equations; their origin and application. Solutions. First order exact differential equation. Integrating factors, Rules to find an integrating factor.

[1] Chapter 1(Sections 1.1and 1.2) Chapter 2 (Sections 2.1, 2.2 and 2.4)

Linear equations and Bernoulli equations. Basic theory of higher order linear differential equations. Solving differential equation by reducing its order. Wronskian and its properties.

[1] Chapter 2 (Section 2.3), Chapter 4 (Sections 4.1 and 4.6)

SEMESTER-IV

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Paper-I

Real analysis

Total Marks: 100 (Theory 80, Internal Assessment 20)

No. of Credits: 4

Base syllabus: MAT-HG-4016/ MAT-RC-4016: Real Analysis (UG CBCS)

Course Level: 200-299

No. of Contact classes: 60

No. of Non-Contact classes: 0

Prerequisites: Class XII level Mathematics

Course Objective: The course will develop a deep and rigorous understanding of real line R andof defining terms to prove the results about convergence and divergence of sequences and series of real numbers. These concepts have wide range of applications in real life scenario.

Course Learning Out comes: This course will enable the students to:

- Understand many properties of the real line R, including completeness and Archimedean properties.
- Learn to define sequences in terms of functions from N to a subset of R.
- Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.
- Apply limit comparison tests for convergence, the ratio, root, Raabe's, integral tests for convergence of an infinite series of real numbers.
- Alternating series and absolute convergence of an infinite series of real numbers.

SEMESTER-IV

Paper-II

Complex Analysis (with practical)

Total Marks: 100

(Theory: 60, Practical 20, Internal Assessment: 20)

No. of Credits: 4 (Theory 3, Practical 1)

Base syllabus: MAT-HC-5016: Complex Analysis (including practical)

Course Level: 200-299

No. of Contact classes: 75 (15×3+30×1)

No. of Non-Contact classes: 0

Prerequisites: Knowledge on

- complex number system as the extension of real number system
- Algebra of complex numbers.
- Properties of complex number.
- Modulus, argument and geometrical representation of complex numbers

Course Objectives: The main objective of this course is to develop a deep understanding of the complex plane together with various related concepts. These concepts have wide applicability in different aspects.

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

- Learn the significance of differentiability of complex functions leading to the understanding of Cauchy−Riemannequations.
- Learn some elementary functions and valuate the contour integrals.
- Understand the role of Cauchy−Goursat theorem and the Cauchy integral formula

SEMESTER-IV

Paper-III

Analytical Geometry

Total Marks: 100 (Theory 80, Internal Assessment 20)

No. of Credits: 4 **(Each unit carries equal credit)**

Base syllabus: MAT-HG-1026: Analytical Geometry (UG CBCS)

Course Level: 200-299

No. of Contact classes: 60

No. of Non-Contact classes: 0

Prerequisites: Class XII Mathematics

Course Objectives: The primary objective of this course is to introduce some basic tools of two-dimensional and three-dimensional coordinate systems and also to familiarise the use of Vector Algebra in Coordinate Geometry.

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

- transform coordinate systems
- learn about pair of straight lines
- have a clear understanding of the conic sections and related properties
- recognise three dimensional surfaces represented by equations of the second degree
- learn two different systems of coordinates which are very useful to define the position of a point in space
- acquire basic concepts of Vector Algebra and understand the use of geometric view of vectors in Coordinate Geometry.

SEMESTER-IV

Paper-IV

Number Theory

Total Marks: 100 (Theory 80, Internal Assessment 20)

No. of Credits: 4

Base syllabus: MAT-HE-5016: Number Theory (UG CBCS)

Course Level: 200-299

No. of Contact classes: 60

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Prerequisites: Mathematics in senior secondary school or equivalent standard.

Course Objectives:

The primary objective of this course is to develop students' understanding of integers, with a focus on their properties and representations, as well as their understanding of number theoretic analysis.

Course Learning Outcomes: On successful completion of the course students will be able to:

- Explain division algorithm, Euclid's algorithms and greatest common divisor.
- Explain the concepts of congruences, linear congruences
- Explore the Chinese Remainder theorem to solve simultaneous linear congruences.
- Explain Fermat's theorem and Wilson's theorem.

Communicate number theoretic techniques to a mathematical audience.

Apply mathematical ideas and concepts within the context of number theory.

Solve a range of problems in number theory

SEMESTER V

Paper.I

Abstract Algebra

Total Marks: 100 (Theory 80, Internal Assessment 20)

No. of Credits: 4

Each unit carries equal credit

No. of Non Contact classes: 0

Base syllabus: MAT-HC-3026: Group Theory-I (UG CBCS)

Course Level: 300-399

No. of Contact classes: 60

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Prerequisites: Mathematics in senior secondary school or equivalent standard.

Course Objectives: The primary objective of this course is to introduce abstract mathematical objects, viz. groups, rings and fields and study their properties. It is also focussed to study the consequences of these mathematical structures.

Course Learning Outcomes: On successful completion of the course students will be able to:

- Recognize the mathematical objects called group, ring and fields.
- Link the fundamental concepts of groups and symmetries of geometrical objects.
- Explain the significance of the notion of Permutation groups, cosets, cyclic groups, normal subgroups, factor groups.
- Analyse consequences of Lagrange's theorem and Fermat's Little theorem.
- Describe structure preserving mappings between groups and their consequences.
- Describe the fundamental concepts in ring theory such as of the subrings, integral domains, ideals, factor rings and fields.

SEMESTER V

Paper.II

Multivariate Calculus

Total Marks: 100 (Theory 80, Internal Assessment 20)

No. of Credits: 4

(Each unit carries equal credits)

(Use of Scientific calculator is allowed)

Base syllabus: MAT-HC-4016: Multivariate Calculus (UG CBCS)

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No. of Contact classes: 60

Course Level: 300 399

No. of Non-Contact classes: 0

Prerequisites: Knowledge on the following topics:

- Functions of single variable, limit, continuity, differentiability and extrema of single variable functions.
- Knowledge of Integration
- Vector valued functions, dot and cross product of vectors.

Course Objectives: To understand the extension of the studies of single variable differential and integral calculus to functions of two or more independent variables. Also, the emphasis will be on the use of Computer Algebra Systems by which these concepts may be analyzed and visualized to have a better understanding. This course will facilitate to becomeaware of applications of multivariable calculus tools in physics, economics, optimization, and understanding the architecture of curves and surfaces in plane and space etc.

No. of Non-Contact classes: 0

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

- Learn the conceptual variations when advancing in calculus from one variable to multivariable discussion.
- Understand the maximization and minimization of multivariable functions subject to the given constraints on variables.
- Learn about inter-relationship amongst the line integral, double and triple integral formulations.
- Familiarize with Green's, Stokes' and Gauss divergence theorems

SEMESTER V

Paper-III

Theory of Real Functions

Total Marks: 100 (Theory 80, Internal Assessment 20)

No. of Credits: 4

Base syllabus: MAT-HC-3016: Theory of Real Functions (UG CBCS)

Course Level: 300-399

No. of Contact classes: 60

Prerequisites: Class XII level Mathematics

Course Objective: The primary objective of this course is to study limit point of set and limit of a function. The discussion on continuous functions and differentiability with some related theorems will also be focused in this course.

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

- Have a rigorous understanding of the concept of limit of a function.
- Learn about continuity and uniform continuity of functions defined on intervals.bounded

Know about applications of mean value theorems and Taylor's theorem understanding for applications.

Learn extensively about the concept of differentiability using limits, leading to a better geometrical Understand

SEMESTER V

Paper-IV

Numerical Analysis (with practical)

Total Marks: 100

(Theory: 60, Practical 20, Internal Assessment: 20)

No. of Credits: 4 (Theory 3, Practical 1)

(Use of Scientific calculator is allowed)

Base syllabus: MAT-HG-4026: Numerical Analysis (UG CBCS)

Course Level: 300-399

No. of Contact classes: 75 (15×3+30×1)

No. of Non-Contact classes: 0

Prerequisites: Class XII level Mathematics, Knowledge on computer software and programming

Course Objectives: To comprehend various computational techniques to find approximate value for possible root(s) of non-algebraic equations, to find the approximate solutions of system of linear equations and Quadratic equations.

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

- Learn some numerical methods to find the zeroes of nonlinear functions of a single variable and solution of asystem of linear equations, up to a certain given level of precision.
- Know about iterative and non-iterative methods to solve system of linear equations
- Know interpolation techniques to compute the values for a tabulated function at points not in the table.
- Integrate a definite integral that cannot be done analytically
- Find numerical differentiation of functional values
- Solve differential equations that cannot be solved by analytical methods

(ii) Newton's interpolation method

(iii) To calculate forward and backward differences

(iv) Trapezoidal rule

(v) Simpson's rule

Note: For any of the CAS *Matlab/Mathematica/Maple* etc., Data types-simple data types, floating data types, character data types, arithmetic operators and operator precedence, variables and constant declarations, expressions, input/output, relational operators, logical operators and logical expressions,

SEMESTER-VI

Paper-I

Linear Algebra

Total Marks: 100 (Theory 80, Internal Assessment 20)

No. of Credits: 4

Each unit carries equal credit

Base syllabus: MAT-HC-5026: Linear Algebra (UG CBCS)

Course Level: 300-399

No. of Contact classes: 60

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Prerequisites for the paper: Senior Secondary School Mathematics or equivalent

Course Objectives: The objective of this course is to introduce the students with the fundamental theory of linear spaces and also emphasizes the application of techniques using the adjoint of linear operator and minimal solutions to systems of linear equations.

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

- Learn about linear spaces and their general properties, linear dependence and linear independence of vectors, bases and dimensions of vector spaces
- Basic concepts of linear transformations, dimension theorem, matrix representations of linear transformations, and the change of coordinate matrix.
- Compute the characteristic polynomial, eigenvalues, eigenvectors and eigenspaces, as well as the geometric and the algebraic multiplicities of an eigenvalue and apply the basic diagonalization result.

  Compute inner products and determine orthogonality on vector spaces including Gram-Schmidt orthogonalization to obtain orthonormal basis.

SEMESTER-VI

Paper-II

Partial Differential Equations (with practical)

Total Marks: 100

(Theory: 60, Practical 20, Internal Assessment: 20)

No. of Credits: 4 (Theory 3, Practical 1)

Base syllabus: MAT-HC-6026: Partial Differential Equations (including practical) (UG CBCS)

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No. of Contact classes: 75 (15×3+30×1)

Course Level: 300 399

No. of Non-Contact classes: 0

Prerequisites: Class XII level Mathematics, Knowledge on computer software

Course Objectives: The main objectives of this course are to teach students to form and solve partial differential equations and use them in solving some physical problems.

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

- Formulate, classify and transform first order PDEs into canonical form.
- Learn about method of characteristics and separation of variables to solve first order PDE's.
- Classify and solve second order linear PDEs.
- Apply the method of separation of variables for solving many well known second order wave equations.

Learn about Cauchy problem for second order PDE and homogeneous and non-homogeneous

PDEs.

SEMESTER-VI

Paper-III

Metric Spaces

Total Marks: 100 (Theory 80, Internal Assessment 20)

No. of Credits: 4

Base syllabus: MAT-HC-6016: Riemann Integration and Metric Spaces (UG CBCS)

Course Level: 300-399 **No. of Non Contact classes: 0**

No. of Contact classes: 60

Prerequisites for the paper: Senior Secondary School Mathematics or equivalent

Course Objectives: Up to this stage, students do study the concepts of analysis which evidently rely on the notion of distance. In this course, the objective is to develop the usual idea of distance into an abstract form on any set of objects, maintaining its inherent characteristics, and the resulting consequences.

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

- Learn various natural and abstract formulations of distance on the sets of usual or unusual entities. Become aware one such formulations leading to metric spaces.
- Analyse how a theory advances from a particular frame to a general frame.
- Appreciate the mathematical understanding of various geometrical concepts, viz. Balls or connected sets etc. in an abstract setting.
- Learn about the two important topological properties of metric spaces, namely connectedness and compactness.

UNIT 1: Definition and examples of Metric spaces, sequences in metric spaces, Cauchy sequences, complete metric spaces. Open and closed balls, neighbourhood, open set, interior of a set. Limit point of a set, closed set, diameter of a set, Cantor's theorem. Subspaces, dense sets, separable spaces.

SEMESTER-VI

Paper-IV

Mechanics

Total Marks: 100

(Theory: 80, Internal Assessment: 20)

No. of Credits: 4

Each unit carries equal credit

Base syllabus: MAT-HE-5026: Mechanics (UG CBCS)

Course Level: 300-399

No. of Contact classes: 60

No. of Non-Contact classes: 0

Prerequisites: Class XII level Mathematics

Course Objectives: The course aims at understanding the various concepts of physical quantities and the related motion of bodies under the action of forces.

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

- Know about the concepts in statics such as moments, couples, equilibrium in both two

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Department of Physics

PROGRAMME OUTCOME & COURSE OUTCOME
DEPARTMENT OF PHYSICS
J. N. COLLEGE, BOKO

PROGRAMME OUTCOME:

1. After completion of graduation students apply their broad knowledge of science across a range of fields, with in-depth knowledge in at least one area of study, while demonstrating an understanding of the local and global contexts in which science is practiced.

2. Articulate the methods of science and explain why current scientific knowledge is both contestable and testable by further inquiry. Apply appropriate methods of research, investigation and design, to solve problems in science.

PROGRAMME SPECIFIC OUTCOME:

Physics (Honours) graduate students will be able to apply critical thinking skills to solve problems that can be modelled mathematically, to critically interpret the natural and physical phenomena, develop experimental skills and independent work culture through a series of experiments that compliment theories and projects. Understand the historical developments in physics and its methodology. Understand number systems, algebra and its significance. Understand the working of basic measuring instruments. Develop effective communication skills.

COURSE	OUTCOMES
Semester: First **Mathematical Physics and Mechanics** **Course Level:** PHY101	*On successful completion of the course, students will be able to understand the calculus of vectors and concept of curved spaces which play central roles in developing insight of the theories of physics. They will learn the powerful method of computation through Dirac delta function which often appears in complex problems of physics. Students will be able to understand and apply the concepts of dynamics of particles, energy, oscillation and basic properties of matter in various problems of physics, technology and engineering. They will be trained in concept realisation through laboratory practices.*

Semester: Two **Mathematical Physics & Electricity and Magnetism** **Course Level:** PHY151	*After the successful completion of the course, students will be able to understand methods of solving various differential equations appearing in physics. It will give an idea of how to study evolution of a physical system. Through matrix algebra students will be able to compute various matrix operations which are required for solving physical problems. They will be able to understand electric field and magnetic fields in matter, dielectric properties of matter, magnetic properties of matter, application of Kirchhoff's law in different circuits, and application of network theorem in different circuits. The students will also get accustomed to using multimeters and potentiometers, and they will be able to determine some of the important physical quantities related to electricity and magnetism for a better understanding of the topic.*
Semester: Three **Waves and Optics** **Course Level:** PHY201	*On successful completion of the course students will:* *1. understand Simple Harmonic Oscillation and superposition principle.* *2. understand the classical wave equation in transvers and longitudinal waves and solutions of few physical systems on its basis.* *3. understand the concept of normal modes in transvers and longitudinal waves* *4. understand the interference as superposition of waves from coherent sources and alsounderstand the basic principle of Young's double slit experiment, Fresnel's Biprism, Newton's Rings, Michelson interferometer etc.* *5. understand the basic concept of diffraction, Fresnel and Fraunhofer diffraction from a slit.* *6. understand the concept of polarisation of light, the production and detection of polarized light.* *7. understand working principle of prism, biprism, spectrometer, Newton's ring apparatus, grating, CRO, sodium and mercury light sources etc.*
Semester: Four **Classical Mechanics**	*On successful completion of the course students will be able to apply the laws of classical dynamics to physical problems of motion of particles, systems of particles and fluids in various fields of physics*

Course Level: PHY251	*and natural science as a whole. They will also get the exposure of the idea of how space and time play role in dynamics of matter.*
Semester: Four **Quantum Mechanics I** **Course Level:** PHY252	*On successful completion of the course students will be able to learn physical and mathematical fundamentals of Quantum physics, and various topics in it. These concepts are used in various branches of physics, like condensed matter physics, lasers, quantum statistics, atomic and molecular physics, particle physics, astrophysics and optics etc.*
Semester: Four **Analog Electronics** **Course Level:** PHY253	*On successful completion of the course, students will be able to understand the physics of semi conductor p-n junction and devices such as rectifier diodes, Zener diode, photodiode, etc.; they will understand the basics of bipolar junction transistors, transistor biasing, and stabilization circuits; the concept of feedback in amplifiers and the oscillator circuits. Students will also have an understanding of operational amplifiers and their applications.*
Semester: Four **Mathematical Physics** **Course Level:** PHY254	*On successful completion of the course, the students will be equipped with the techniques related to solving partial differential equations using separation of variables method, application of Fourier series analysis, solving complex integrations, dealing with tensors and probability distributions which are relevant while dealing with wave mechanics, electrodynamics, quantum mechanics, theory of relativity and experimental physics.*
Semester: Five **Atomic and Molecular Physics** **Course Level:** PHY-301	*Students will be ability to describe the atomic spectra of one and two valance electron atoms and will also understand the change in behaviour of atoms and corresponding modification of their spectra in external applied electric and magnetic field. They will understand the basic principle of pure rotational, vibrational, Rotation-Vibration and Raman spectra of molecules and their few applications.*
Semester: Five	*On successful completion of the course students will be able to acquire the basic knowledge of crystal structure, bonding in solids and elementary*

Condensed Matter Physics **Course Level:** PHY302	*idea lattice dynamics of materials, dielectric, ferroelectric and magnetic properties of solids, the physics of electrons in solids, basic idea about nanomaterials, thin film and soft matter and understand the basic concept in superconductivity.*
Semester: Five **Heat and Thermodynamics** **Course Level:** PHY303	*Upon completion of this course, students will be able to learn thermal properties of gas molecules and their collisions. With this course, students will acquire knowledge of thermodynamics with practical insights into thermal physics, which will help them to understand real world situations.*
Semester: Five **Electromagnetic Theory** **Course Level:** PHY304	*After the successful completion of the course, students will acquire the concepts of Maxwell's equations, propagation of electromagnetic (EM) waves in different homogeneous-isotropic as well as anisotropic unbounded and bounded media, production and detection of different types of polarized EM waves, general information of waveguides and fibre optics.*
Semester: Six **NUCLEAR & PARTICLE PHYSICS** **Course Level:** PHY351	*On successful completion of the course, the students shall be able to understand the structure and properties of a nucleus. They will also know about the properties of strong nuclear force that keeps the nuclei bound. They will learn about the radioactive decays and various laws of radioactive disintegration. Students will have adequate knowledge on the construction and working principles of particle accelerators and detectors. Moreover, students will be introduced to the world of particle physics – types and interactions. The acquired knowledge can be applied in the areas of nuclear medicine, medical physics, archaeology, geology and other interdisciplinary fields of Physics and Chemistry. It will enhance the special skills required for these fields.*
Semester: Six **Digital Electronics** **Course Level:** PHY352	*After successful completion of the course student will be able to develop, implement and analyze digital logic circuits and apply them to solve real-life problems and classify different semiconductor memories*
Semester: Six **Astronomy**	*On successful completion of this course students will be able to understand the fundamental*

and **Astrophysics** **Course Level:** PHY353	*concepts in astronomy. They will be able to apply physics of celestial objects in understanding the universe. They will be equipped with the skills required for (i) observational astronomy (ii) virtual observatory tools and (iii) physical concepts of recent frontiers in astrophysics.*
Semester: Six **Statistical Mechanics** **Course Level:** PHY354	*Upon completion of the course, students will get accustomed to the microscopic origin of thermodynamic processes. After successful completion of the course, students will be able to perceive classical and quantum pictures of physical and chemical events.*

HoD, Physics .
J. N. College, Boko

Department of Zoology

Program outcomes, & course outcomes

DEPARTMENT OF ZOOLOGY

The College is permanently affiliated to Gauhati University and it follows the programme wise curriculum designed by the university. The learning outcomes of the programmes and courses are stated clearly by the university. The same is published in the official website of the university which can be downloaded by the affiliated colleges.

The College has its own mechanism to communicate the learning outcomes of the curriculumto the teachers and the students. The following measures are adopted-

- Hard copy of syllabi and learning outcomes are available in all the departments for ready reference to the teachers and students.
- A web link to the Gauhati University Curriculum and learning outcomes of Programmes and Courses is also provided in the college website for reference.
- The departments also arrange Orientation Programmes/Tutorial Meetings to make the students aware of the curriculum and the learning outcomes.

Programme Outcome	Gauhati University's FYUGP is built on the Choice-Based Credit System (CBCS). Students can exit the program after one, two, or three years, and receive a certificate, diploma, or bachelor's degree, respectively. Students who complete the entire four-year program receive a bachelor's degree with honors. After completing an FYUGP, students can pursue a master's degree, or even a doctorate. They can also explore careers in wildlife conservation, environmental consulting, animal welfare organizations, zoos, museums, and research institutes .
	Course outcome
Semester I. **Core A1 : Diversity of Non-chordates** **Code : ZOO-1011**	**Course Objectives:** The course would provide an insight to the learner about the existence of different the existence of different life forms on the earth and appreciate the diversity of animal life. That will help the students to understand the features of the Kingdom Animalia and systematic organization of the animals based on evolutionary relationships , structural and functional affinities . That will also make the students aware about the characteristics morphological and anatomical features of diverse animals, economic , ecological and medical significance of various animals in human life; and create interest among them to explore the animal diversity in nature. .

	Learning Outcomes: Upon completion of the course, students should be able to: 1. Learn about the importance of systematics, taxonomy and structural organization of animals. 2. Understand evolutionary history and relationships of different non-chordates through functional and structural affinities. 3. Critically analyze the organization, complexity and characteristic features of chordates making them familiarize with the morphology and anatomy of representatives of various animal phyla. 4. Comprehend the economic importance of non-chordates, their interaction with the environment and role in the ecosystem. 5.Enhance collaborative learning and communication skills through practical sessions teamwork, group discussions, assignments and projects.
Semester II Core A2 : Diversity of Chordates Code : ZOO-2011	**Course objectives :** The course is designed with an aim to provide scope and historical background of chordates. It will impart knowledge regarding basic concepts of origin of chordates and make the students under the characteristics and classification of animals with notochord. The exclusive phenomena in chordates like biting mechanism in snakes, flight adaptations in birds etc. Will be explained. The adequate explanation to the students regarding various mechanisms Involved in thriving survival of the animals within their geographic realms will create interest among students. **Learning Outcomes:** Upon completion of the course, the students will be able to: 1.Understand different classes of chordates, level of organization and evolutionary relationship between different subphyla and classes, within and outside the phylum. 2.Study about diversity in animals making students understand about their distinguishing features. 3.Appreciate similarities and differences in life functions among various groups of animals in Phylum Chordata. 4.Comprehend the circulatory, nervous and skeletal system of chordates. 5. Know about the habit and habitat of chordates in marine, freshwater and terrestrial ecosystems.

Semester III **MAJOR** **Compulsory** **PRINCIPLES OF GENECTICS** **CODE:ZOO-2011**	**Course Objectives:** Human beings had been applying the principles of genetics by engaging in selective breeding of domesticated animals for many centuries. However, it was only with the work of Mendel and advent of 20th century, that basic principles of the science of genetics were formulated. In about a century of its existence, this field has generated tremendous amount of knowledge through observational and experimental research. The information amassed in the last century has laid the foundation for more discoveries in this important field of life science. This course aims to provide an overview of genetics starting from the work of Mendel to the current understanding of various phenomena like gene mapping, sex determination and mutations. The course will help in building sound fundamental knowledge of the principles of genetics, to be used as a stepping stone for higher studies and research in this field. **Learning Outcomes:** Upon completion of the course, students will be able to: 1. Understand the basic principles of inheritance. 2. Analyze Mendelian Law and gene interactions leading to development of analytical skills and critical thinking enabling the students to present the conclusion of their findings in a scientific manner. 3. Know the mechanisms of mutations, the causative agents and the harmful impact of various chemicals and drugs being used in day-to-day life. 4. Gain knowledge on genetic and environmental basis of sex determination.

(Dr. Tapan Dutta)
Principal
J.N. College, Boko

Principal
Jawaharlal Nehru College
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