

**PROGRAMME OUTCOME AND COURSE OUTCOME**  
**DEPARTMENT : ECONOMICS**

**PROGRAMME OUTCOME**

*This programme will enable students to imbibe knowledge about different concepts, theories and laws of Economics. It will also help them in utilizing their learning in real life situations.*

**COURSE OUTCOME**

<b>SEMESTER-I Core</b>	<p><b>Paper- Core ECO-HC 1016(Introductory Microeconomics):</b> This course is designed to expose the students to the basic principles of microeconomic theory. In this course students may study different micro economics concepts like demand and supply, working of markets, markets and welfare, different market structure like perfect and imperfect, input markets etc. By studying all these concepts students can get idea about the applicability of different concepts in the real life situation.</p> <p><b>Paper- Core ECO-HC 1026(Mathematical methods in economics):</b> This course covers the basic idea about different mathematical concepts like sets, functions, differentiation and integration. By studying these concepts students will be able apply mathematical techniques to economics theory.</p>
<b>SEMESTER-I-GE</b>	<p><b>Paper- ECO-HG-1016(Principles of Microeconomics–I)</b> This course intends to expose the student to the basic principles in Microeconomic Theory and its illustration with applications. Various topics included in this course are: Problem of scarcity and choice, Demand and supply, Applications of demand and supply, price rationing, price floors, consumer surplus, producer surplus, Elasticity, Consumer Theory, Production and Costs, and Perfect Competition.</p>
<b>SEMESTER-II Core</b>	<p><b>Paper- Core ECO-HC-2016(Introductory Macroeconomics):</b> This course aims to introduce the students to the basic concepts of Macroeconomics. In this course students may study concepts of macroeconomics which deals with the aggregate economy. By studying this course students can get idea with the preliminary concepts associated with the determination and measurement of aggregate macroeconomic variable like savings, investment, GDP, money, inflation, and the balance of payments.</p> <p><b>Paper – Core ECO-HC-2026(Mathematical Methods in economics - II):</b> This is the second part of a compulsory two-course sequence. By studying this course students will be able to transmit the body of basic mathematics in the study of economic theory, specifically the microeconomic theory and macroeconomic theory. In this course students will study linear algebra, real variable functions, multi variable optimization, and differential equation and difference equation.</p>
<b>SEMESTER-II-GE</b>	<p><b>Paper - ECO-HG-2016(Principles of Microeconomics–II):</b> This is a sequel to Principles of Microeconomics covered in the first semester. Topics in this course are - Market Structures, Theory of a Monopoly Firm, Imperfect Competition, Factor pricing and Market Failure.</p>
<b>SEMESTER-III Core</b>	<p><b>Paper- Core ECO-HC-3016(Intermediate Microeconomics-I):</b> This course is designed to provide a sound training in microeconomic theory to formally analyse the behaviour of individual agents. Since students are already familiar with the quantitative techniques in the previous semesters, mathematical tools are used to facilitate understanding of the basic concepts. This course looks at the behaviour of the consumer and the producer and also covers the behaviour of a competitive firm.</p> <p><b>Paper- Core ECO-HC-3026(Intermediate Macroeconomics-I):</b> This course introduces the students to formal modeling of a macro-economy in terms of analytical tools. It discusses various alternative theories of output and employment determination in a closed economy in the short run as well as medium run, and the role of policy in this context. It also introduces the students to various theoretical issues related to an open economy.</p> <p><b>Paper- Core ECO-HC-3036(Statistical Methods for Economics):</b> This is a course on statistical methods for economics. It begins with some basic concepts and terminology that are fundamental to statistical analysis and inference. It then develops the notion of probability, followed by probability distributions of discrete and continuous random variables and of joint distributions. This is followed by a discussion on sampling</p>

	<p>techniques used to collect survey data. The course introduces the notion of sampling distributions that act as a bridge between probability theory and statistical inference. The semester concludes with some topics in statistical inference that include point and interval estimation.</p>
<b>SEMESTER-III-GE</b>	<p><b>Paper- ECO-HG-3016(Principles of Macroeconomics-I):</b> This course introduces students to the basic concepts in Macroeconomics. Macroeconomics deals with the aggregate economy. In this course the students are introduced to the definition, measurement of the macroeconomic variables like GDP, consumption, savings, investment and balance of payments. The course also discusses various theories of determining GDP in the short run.</p>
<b>SEMESTER-III-SE</b>	<p><b>Paper-ECO-SE-3014(Data Collection and Presentation):</b> This course helps students in understanding use of data, presentation of data using computer software like MS-Excel. Students will be involved practically in the preparation of questionnaires/interview schedules, collection of both primary and secondary data and its presentation. Students will also be asked to prepare a report on collected data and will be evaluated accordingly.</p>
<b>SEMESTER-IV</b>	<p><b>Paper-ECO-HC-4016(Intermediate Microeconomics-II):</b> This course is a sequel to Intermediate Microeconomics I. In this course the emphasis is given on giving conceptual clarity to the student coupled with the use of mathematical tools and reasoning. It covers general equilibrium and welfare, imperfect markets and topics under information economics.</p> <p><b>Paper-ECO-HC-4026(Intermediate Macroeconomics – II):</b> This course is a sequel to Intermediate Macroeconomics I. In this course, the students are introduced to the long run dynamic issues like growth and technical progress. It also provides the micro-foundations to the various aggregative concepts used in the previous course.</p> <p><b>Paper-ECO-HC-4036(Introductory Econometrics):</b> This course provides a comprehensive introduction to basic econometric concepts and techniques. It covers statistical concepts of hypothesis testing, estimation and diagnostic testing of simple and multiple regression models. The course also covers the consequences of and tests for misspecification of regression models.</p>
<b>SEMESTER- IV- GE</b>	<p><b>Paper- ECO-HG-4016(Principles of Macroeconomics-II):</b> This course is the sequel to Principles of Macroeconomics-I. It analyses various theories of determination of National Income in greater detail. It also introduces students to concept of inflation, its relationship with unemployment and some basic concepts in an open economy.</p>
<b>SEMESTER-IV-SE</b>	<p><b>Paper-ECO-SE-4014(Data Analysis):</b> This course discusses how data can be summarized and analysed for drawing statistical inferences. The students will be introduced to important data sources that are available and will also be trained in the use of statistical softwares like SPSS/PSPP to analyse data.</p>
<b>SEMESTER -V</b>	<p><b>Paper- ECO-HC-5016(Indian Economy-I):</b> Using appropriate analytical frameworks, this course reviews major trends in economic indicators and policy debates in India in the post-Independence period, with particular emphasis on paradigm shifts and turning points.</p> <p><b>Paper- ECO-HC-5026(Development Economics-I):</b> This is the first part of a two-part course on economic development. The course begins with a discussion of alternative conceptions of development and their justification. It then proceeds to aggregate models of growth and cross-national comparisons of the growth experience that can help evaluate these models. The axiomatic basis for inequality measurement is used to develop measures of inequality and connections between growth and inequality are explored. The course ends by linking political institutions to growth and inequality by discussing the role of the state in economic development and the informational and incentive problems that affect state governance.</p> <p style="text-align: center;"><b><u>DISCIPLINE SPECIFIC ELECTIVE (DSE) PAPERS: (ANY TWO PAPERS)</u></b></p> <p><b>Paper - ECO-HE-5016(Economics of Health and Education):</b> The importance of education and health in improving well-being is reflected in their inclusion among the</p>

	<p>Millennium Development Goals adopted by the United Nations member states, which include among other goals, achieving universal primary education, reducing child mortality, improving maternal health and combating diseases. This course provides a microeconomic framework to analyse, among other things, individual choice in the demand for health and education, government intervention and aspects of inequity and discrimination in both sectors. It also gives an overview of health and education in India.</p> <p><b>Paper - ECO-HE-5026(Money and Financial Markets):</b> This course exposes students to the theory and functioning of the monetary and financial sectors of the economy. It highlights the organization, structure and role of financial markets and institutions. It also discusses interest rates, monetary management and instruments of monetary control. Financial and banking sector reforms and monetary policy with special reference to India are also covered.</p> <p><b>Paper - ECO-HE-5036(Public Finance):</b> This course is a non-technical overview of government finances with special reference to India. It will look into the efficiency and equity aspects of taxation of the centre, states and the local governments and the issues of fiscal federalism and decentralization in India. The course will be useful for students aiming towards careers in the government sector, policy analysis, business and journalism.</p>
<p><b>SEMESTER - VI</b></p>	<p><b>Paper- ECO-HC-6016(Indian Economy-II):</b> This course examines sector-specific policies and their impact in shaping trends in key economic indicators in India. It highlights major policy debates and evaluates the Indian empirical evidence. Given the rapid changes taking place in the country, the reading list will have to be updated annually.</p> <p><b>Paper- ECO-HC-6026(Development Economics-II):</b> This is the second module of the economic development sequence. It begins with basic demographic concepts and their evolution during the process of development. The structure of markets and contracts is linked to the particular problems of enforcement experienced in poor countries. The governance of communities and organizations is studied and this is then linked to questions of sustainable growth. The course ends with reflections on the role of globalization and increased international dependence on the process of development.</p> <p style="text-align: center;"><b><u>DISCIPLINE SPECIFIC ELECTIVE (DSE) PAPERS: (ANY TWO PAPERS)</u></b></p> <p><b>Paper-ECO-HE-6016(Environmental Economics):</b> This course focuses on economic causes of environmental problems. In particular, economic principles are applied to environmental questions and their management through various economic institutions, economic incentives and other instruments and policies. Economic implications of environmental policy are also addressed as well as valuation of environmental quality, quantification of environmental damages, tools for evaluation of environmental projects such as cost-benefit analysis and environmental impact assessments. Selected topics on international environmental problems are also discussed.</p> <p><b>Paper-ECO-HE-6026(International Economics):</b> This course develops a systematic exposition of models that try to explain the composition, direction and consequences of international trade, and the determinants and effects of trade policy. It then builds on the models of open economy macroeconomics developed in courses 08 and 12, focusing national policies as well as international monetary systems. It concludes with an analytical account of the uses and consequences of the rapid expansion of international financial flows in recent years. Although the course is based on abstract theoretical models, students will also be exposed to real-world studies.</p> <p><b>Paper-ECO-HE-6036(The Economy of Assam):</b> This course will provide students an idea of evolution of the Assam Economy from the colonial period to the contemporary time. The course is expected to help students to better appreciate the challenges and opportunities of the economy of Assam in the present context.</p>



**PROGRAMME OUTCOME AND COURSE OUTCOME  
DEPARTMENT : EDUCATION**

**PROGRAMME OUTCOME**

*The outcome of the programme will be to develop a holistic and multidimensional understanding of the topics. It attempts to approach new areas of learning, develop competencies in the students thereby opening various avenues for self-discovery, academic understanding and employment. After completing the programme the students will be able to develop an understanding of real life issues.*

**COURSE OUTCOME: LEARNING OUTCOMES OF THE COURSE**

**1ST SEMESTER (HONOURS)**

**Paper: EDU-HC-1016: PRINCIPLES OF EDUCATION**

**Course Outcome:** After completion of this course the learner will be able to:

- Learn the sound principles of education, important concepts of Education, Curriculum, Democracy, Discipline and Freedom.
- Develop knowledge about different Aims of Education, various types of Curriculum, Correlation of Studies and Forms of Discipline.
- Familiarize the students with democratic idea of modern education.

**Paper: EDU-HC-1026: PSYCHOLOGICAL FOUNDATIONS OF EDUCATION**

**Course Outcome:** After completion of this course the learner will be able to:

- Understand the relationship between education and psychology, 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, measurement, and concept of emotional intelligence.
- Acquaint with different types of personality and the adjustment mechanism.

**Paper: EDU-HG/RC-1016: FOUNDATIONS OF EDUCATION**

**Course Outcome:** After completion of this course the learner will be able to:

- Know the principles of education, gain knowledge about different Forms and Aims of Education
- Understand the concept and importance of Discipline and Freedom.
- Acquire knowledge about the concept of Emotional and National Integration and International Understanding.

**2ND SEMESTER (HONOURS)**

**Paper: EDU-HC-2016: PHILOSOPHICAL AND SOCIOLOGICAL FOUNDATION OF EDUCATION**

**Course Outcome:** After completion of this course the learner will be able to:

- Know the concept of philosophy and its relationship with education.
- Understand the educational implications of different Indian schools of philosophy.
- Understand the educational implications of different Western schools of philosophy.
- Know the concept of sociology and its relationship with education.
- Develop understanding about the concept of educational sociology, social groups and socialization.

**Paper: EDU-HC-2026: DEVELOPMENT OF EDUCATION IN INDIA-I**

**Course 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

**Paper: EDU-HG/RC-2016: PSYCHOLOGY OF ADOLESCENTS**

**Course Outcome:** After completion of this course the learner will be able to:

- Understand the period of adolescence
- Understand the significance of the adolescence period in human life
- Know about various problems associated with this stage
- Understand the development aspects of adolescence, importance of adolescence period and problems associated with this stage.

**3RD SEMESTER (HONOURS)**

**Paper:EDU-HC-3016: DEVELOPMENT OF EDUCATION IN INDIA-II**

**Course Outcome:** After completion of this course the learner will be able to:

- 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
- Analyze the National Policy on Education in different tomes
- Accustom with the recent Educational Development in India

**Paper:EDU-HC-3026: EDUCATIONAL TECHNOLOGY AND TEACHING METHODS**

**Course Outcome:** After completion of this course the learner will be able to:

- Understand the objective of educational technology in teaching learning process
- Acquaint with innovations in the field of education through technology
- Understand about various methods and devices of teaching
- Acquaint students with levels, effectiveness of teaching and classroom management
- Understand the strategies of effective teaching as a profession.

**Paper:EDU-HC-3036: VALUE AND PEACE EDUCATION**

**Course Outcome:** After completion of this course the learner will be able to:

- Understand the concept and meaning of value.
- Become aware about the role of educational institutions in building a value based society.
- Understand the meaning and concept of peace and its importance in human life.
- Understand the meaning and importance of peace education and its relevance at national and international level.
- Identify the different issues/ challenges in imparting peace education.
- Identify the strategies and skills in promoting peace education at institutional level.

**Paper:EDU-HG/RC-3016: GUIDANCE AND COUNSELLING**

**Course Outcome:** After completion of this course the learner 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 the students with the organization of guidance service and school guidance clinic
- Understand the challenges faced by the teacher as guidance worker.

**Paper: EDU-SEC- 3014: PUBLIC SPEAKING SKILL**

**Course Outcome:** After completing this course, students will be able to acquire the capacities of public speaking skill.

**4TH SEMESTER (HONOURS)**

**Paper: EDU-HC-4016: GREAT EDUCATIONAL THINKERS**

**Course Outcome:** After completion of this course the learner will be able to:

- Learn the Philosophy of life of different Educational Thinkers and their works.
- Learn about the views of thinkers in educational context.
- Learn about relevance of some of their thoughts at present day context.

**Paper: EDU-HC-4026: EDUCATIONAL STATISTICS AND PRACTICAL**

**Course Outcome:** After completion of this course the learner will be able to:

- Develop the basic concept of Statistics,
- Know different statistical procedures used in Education.
- Develop the ability to represent educational data through graphs.
- Understand the Normal Probability Curve and its applications in Education.

**Paper:EDU-HC-4036: EMERGING ISSUES IN EDUCATION**

**Course Outcome:** After completion of this unit, students will be able to-

- Know major emerging issues national, state, and local
- Know 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.

**Paper:EDU-HG/RC-4016: HISTORY OF EDUCATION IN INDIA**

**Course Outcome:** After completion of this course the learner will be able to:

- 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 tomes
- Accustom with the recent Educational Development in India.

**Paper: EDU-SE-4014 : WRITING BIODATA AND FACING AN INTERVIEW**

**Course Outcome:** After completing this course, students will be able to write a bio-data scientifically and will develop confidence to face different types of interview.

**5TH SEMESTER (HONOURS)**

**Paper:EDU-HC-5016: MEASUREMENT AND EVALUATION IN EDUCATION & PRACTICAL**

**Course Outcome:** After completion of this course the learner will be able to:

- Understand the concept of measurement and evaluation in education.
- Know the general procedure of test construction and characteristics of a good test.
- Develop an understanding of different types of educational tests and their uses.
- Know about personality test, and aptitude tests.

**Paper: EDU-HC-5026: GUIDANCE AND COUNSELLING**

**Course Outcome:** After completion of this course the learner will be able to:

- Understand the concept, need and importance of Guidance and Counselling.
- Know the different types and approaches to Guidance and Counselling.
- Familiarize with the organization of guidance service and school guidance clinic.
- Understand the challenges faced by the teacher as guidance worker.

**Paper: EDU-DSE-5026: DEVELOPMENTAL PSYCHOLOGY**

**Course Outcome:** After completion of this course the learner will be able to:

- Understand the basic concepts relating to development.
- Get knowledge about heredity and environmental factors affecting pre-natal development.
- Understand the development aspects during infancy and childhood.
- Understand the development aspects of adolescence, importance of adolescence period and problems associated with this stage.

**Paper: EDU-DSE-5046: TEACHER EDUCATION IN INDIA**

**Course 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 organising 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 India.
- Understand and conceive the qualities, responsibilities and professional ethics of teachers.

### **6TH SEMESTER (HONOURS)**

**Paper: EDU-HC-6016: EDUCATION AND DEVELOPMENT**

**Course Outcome:** After completion of this course the learner will be able to:

- Relation between education and development.
- Educational development in the post globalization era.
- Role of education in community development.
- Education for human resource development.
- Economic and political awareness through education.

**Paper: EDU-HC-6026: PROJECT**

**Course Outcome:** After completion of this course the learner will be able to:

- Explain the process of conducting a Project.
- Prepare a Project Report.

**Paper: EDU-DSC-6026: SPECIAL EDUCATION**

**Course Outcome:** After completion of this course the learner will be able to

- Understand the meaning and importance of special education.
- Acquaint with the different policies and legislations of special education.
- Know the students with the different types of special children with their characteristics.
- Know about different issues, educational provisions and support services of special education.

**Paper: EDU-DSC-6036: EDUCATIONAL MANAGEMENT**

**Course Outcome:** After completion of this course the learner will be able to

- Develop an understanding of the basic concept of educational management.
- Know about the various resources in education.
- Understand the concept and importance of educational planning.
- Know about the financial resources and financial management in education.

### **5TH SEMESTER (REGULAR)**

**Paper: EDU-DSE-5026: DEVELOPMENTAL PSYCHOLOGY**

**Course Outcome:** After completion of this course the learner will be able to:

- Understand the basic concepts relating to development.
- Acquaint about heredity and environmental factors affecting pre-natal development.
- Understand the development aspects during infancy and childhood.
- Understand the development aspects of adolescence, importance of adolescence period and problems associated with this stage.

**Paper: EDU-DSE-5046: TEACHER EDUCATION IN INDIA**

**Course 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 organising 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 India.
- Understand and conceive the qualities, responsibilities and professional ethics of teachers.

**Paper: EDU-RG-5016: DISTANCE EDUCATION**

**Course Outcome:** After completion of this course the learner will be able to:

- Understand the concept of distance education and its growth in India and Assam.
- Acquaint with the growing need and importance of distance education.
- Acquaint with the different forms and methodologies applied in distance education.
- Understand different programmes of distance education.
- Acquaint with different instructional strategies of distance education.

**Paper: EDU-SE-5014: EXTENSION ACTIVITIES**

**Course Outcome:** After completing this course, students will be able to do extension activities.

**6TH SEMESTER (REGULAR)**

**Paper: EDU-DSC-6026: SPECIAL EDUCATION**

**Course Outcome:** After completion of this course the learner will be able to

- Understand the meaning and importance of special education.
- Acquaint with the different policies and legislations of special education.
- Familiarize with the different types of special children with their characteristics.
- Know about different issues, educational provisions and support services of special education.

**Paper: EDU-DSC-6036: EDUCATIONAL MANAGEMENT**

**Course Outcome:** After completion of this course the learner will be able to

- Develop an understanding of the basic concept of educational management.
- Know about the various resources in education.
- Understand the concept and importance of educational planning.
- Know about the financial resources and financial management in education.

**Paper: EDU-RG-6016: MENTAL HEALTH AND HYGIENE**

**Course 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.
- Familiarize with the concept and issues of positive psychology, mental health of women, role of WHO and stress management.

**Paper: EDU-SE-6014: DEVELOPING TEACHING SKILL**

**Course Outcome:** After completing this course, students will be able to develop understanding about different teaching skills which are used in classroom transaction.





**PROGRAMME OUTCOME AND COURSE OUTCOME  
DEPARTMENT : ENGLISH**

**PROGRAMME OUTCOME**

*The programme consists of a range of papers designed to develop an overall understanding of English literature among the students. It also familiarizes the students with the historical development of English literature, its varieties like Indian English Literature and American English Literature and various recent trends and approaches that have been incorporated into its field.*

**COURSE OUTCOME**

**SEMESTER-I**

**Paper 1: ENG-HC-1016 Indian Classical Literature:** This paper introduces students to a selection of literatures of India in English translation. Given that Indian Classical Literature offers a rich and diverse canvas that spans across genres like drama, poetry, the epic narrative as well as short fictional fables, to name a few, it is essential that students studying English literature are familiar with at least a few of these. This paper encourages students to think laterally about literatures of the world, and the possibility of cultural exchange.

**Paper 2: ENG-HC-1026 European Classical Literature:** This paper introduces the students to some of the classics of European literature. Classical writing in Europe saw the emergence of traditions that cut across many genres, which included poetry, theatre, and general discourses. While the Aristotelian focus on the examination of the essentials of poetry extended to incorporate discussions on epic and drama, subsequent writers such as Horace drew attention to the purposefulness of the creative exercise. In the theatre the widely divergent compositions by Sophocles and Plautus respectively show the consolidation of a rich cultural discourse. It is this enriching literary tradition that this paper seeks to familiarize with through the study of representative texts belonging to the Classical Period.

**SEMESTER-II**

**Paper 3: ENG-HC-2016 Indian Writing in English:** This paper on Indian Writing in English introduces students to the historical development of this body of writing- the challenges faced by early writers, the growing sense of accomplishment in the writing of different forms and the interpretation of individual and collective experience in colonial and postcolonial India. The paper is divided into three units, each dealing with a specific literary form.

**Paper 4: ENG-HC-2026 British Poetry and Drama: 14th to 17th Centuries:** This paper aims to familiarize the students with the two major forms in British literature from the 14th to the 17th centuries – poetry and drama, apart from acquainting them with the contexts that generated such literatures. The larger contexts of the Renaissance, the nature of the Elizabethan Age and its predilections for certain kinds of literary activities, and the implications of the emergence of new trends will be focused in this paper. It will also highlight the seminal issues and preoccupations of the writers and their ages as reflected in these texts.

**SEMESTER-III**

**Paper 5: ENG-HC-3016 History of English Literature and Forms:** This paper introduces students to the History of English Literature and the major literary forms. It adopts a chronological approach to the study of poetry, drama, fiction and non-fictional prose, showing the development of each form as it moves through the various periods of English literature and its expansion into global English writing. While authors have been named in some instances as representative of forms and periods, in other cases, especially in the 20th and 21st centuries, the expansion of the field has meant that individual authors are too numerous to name. Hence certain directions and areas of study have been indicated.

**Paper 6: ENG-HC-3026 American Literature:** This paper seeks to acquaint the students with the main currents of American literature in its social and cultural contexts. The texts incorporated in the paper are a historical reflection of the growth of American society and of the way the literary imagination has grappled with such growth and change. A study of the paper, hence, should lead to an acquaintance with the American society in its evolutionary stages from the beginnings of modernism to the present as well as with exciting generic innovations and developments that have tried to keep pace with social changes.

**Paper 7: ENG-HC-3036 British Poetry and Drama: 17th and 18th Centuries:** This paper aims to familiarize the students with British literature in the 17th and 18th centuries, a time-period which sees the emergence and establishment of

greatly diverse kinds of writings. The selected texts may encourage the students to look at the economic, political and social changes in (primarily) Britain during this period, such as the shifts from the Puritan Age to the Restoration and Neoclassical periods. The paper also seeks to familiarize the students with the larger contexts that generated such literatures as well as the possible impacts of the literature on society. The significance of the scientific revolution during this period may also be studied in relation to the literary productions.

#### **SEMESTER-IV**

**Paper 8: ENG-HC-4016 British Literature: The 18th Century:** This paper aims to familiarize the students with British literature in the 18th century. A very interesting age in which reason and rationality dominated, this age saw the publication of some of the best novels and works of non-fictional prose and poetry in the English language. Though it was not predominantly an age of drama yet one cannot but pay attention to the few plays of the century. Although the texts in the course are mostly by men it must be noted that quite a number of women writers were also part of the literary scene. The texts in the course are representative of the age and to some extent representative of the forms as well. The selected texts hope to give the students an overview of the age and the writings that the age produced.

**Paper 9: ENG-HC-4026 British Romantic Literature:** The nineteenth century begins with the triumph of the Romantic imagination, expressing itself most memorably in the poetry of Blake, Burns, Wordsworth, Coleridge, Shelley, and Keats. The poetry of the age fashions itself partly in revolt to the spirit of the previous age, with very different ideas about the relationship between humans and nature and the role of the poet taking hold. This paper includes selections from works of major Romantic poets which address these issues, enabling students to appreciate the essence of the Romantic vision. In addition they will read that remarkable oddity, Frankenstein, a novel that also illuminates Romanticism from another angle.

**Paper 10: ENG-HC-4036 British Literature: The 19th Century:** The middle and later parts of the 19th century sees the novel coming into its own, although Jane Austen has already established the prestige of the novel form through her incisive explorations of the complexity of human motive and conduct, especially in their worldly affairs. The texts chosen will expose the students to the ground-breaking efforts of the poets as well to the works of fiction writers who manage to consolidate and refine upon the achievements of the novelists of the previous era. Austen to Rossetti represents a remarkable literary development and range of works, addressing a very diverse array of social preoccupations.

#### **SEMESTER-V**

**Paper 11: ENG-HC-5016 British Literature: The 20th Century:** While literary modernity can trace its roots to the works of some European writers of the 19th century, in England it is in the 20th century that the era of Modernism finds its voice in arts and literature. The works of the writers chosen for this paper are good introductions to the spirit of modernism, with its urgent desire to break with the codes and conventions of the past, experiment with new forms and idioms, and its cosmopolitan willingness to open itself up to influences coming from other shores. The paper goes beyond the High Modern period of the early century and the students will also get acquainted with the ethos of postmodernism through a reading of recent poetic and fictional works.

**Paper 12: ENG-HC-5026 Women's Writing:** This paper seeks to direct the students' attention to nineteenth and twentieth century writings by women living in different geographical and socio cultural settings. Students will get acquainted with the situationally distinct experiences of women articulated in a variety of genres-poetry, novels, short stories, and autobiography, while the selections from Mary Wollstonecraft-the only 18th century text prescribed, will acquaint students with the ideas contained in one of the earliest feminist treatises of the western world. Apart from an examination of the themes and styles in the prescribed texts, students will be required to engage themselves with the specificities of the contexts from which the texts emerged and also analyze the women writers' handling of the different genres to articulate their women-centric experiences.

#### **DISCIPLINE CENTRIC ELECTIVE**

**Paper 2: ENG-HE-5026 Modern Indian Writing in English Translation:** Literature in the various Indian languages presents a huge body of work testifying to the diverse cultural and regional preoccupations in the respective regions these languages belong to. This paper attempts to give students an introductory glimpse into this richness and diversity of Indian literature written in the regional languages.

**Paper 3: ENG-HE-5036 Literature of the Indian Diaspora:** In the light of global literature today focusing extensively on ideas of transnationalism, exile, migration, displacement, and so on, literature of the diaspora has come to exert a

strong presence in the global scene. This paper will look at the diasporic experience with particular reference to Indian diasporic writers.

#### **SEMESTER-VI**

**Paper 13: ENG-HC-6016 Modern European Drama:** The paper aims at introducing students to the innovative dramatic works of playwrights from different locations in Europe, which taken together represents the wide range of modern drama and its fortunes on the written page and the stage. The selected plays would allow an understanding of the emergence of avant garde movements and trends and dramatic devices and techniques during the period of modernism which eventually influenced theatrical practices in other nations of the world.

**Paper 14: ENG-HC-6026 Postcolonial Literatures:** European Colonialism since the fifteenth century changed the face of the world in many significant ways, and the effects of the experience of colonialism remain in many countries around the world even in the postcolonial era. This paper gives the students an opportunity to acquaint themselves with some of the novels, short stories and poems from postcolonial literatures across the world, with the texts showcasing the many regional, cultural differences and peculiarities, as well as common and shared experiences of the postcolonial condition.

#### **DISCIPLINE CENTRIC ELECTIVE**

**Paper 9: ENG-HE-6036 Partition Literature:** The Partition of the Indian sub-continent was a major event that resulted in large-scale displacement, extreme violence and prolonged trauma. This paper offers an insight into some of the literary works written in its backdrop that encapsulate the predicament of people during such an upheaval and also the crisis of identity faced by them.

**Paper 12: ENG-HE-6066 Writings from North East India:** This paper acquaints the students with some of the representative works from North East India, many of which have been translated from their original language of composition into English. Its division into four sections covering some oral narratives, poetry, fiction, prose and drama gives an overall idea of the various literary genres that have developed in the region.



**PROGRAMME OUTCOME AND COURSE OUTCOME**  
**DEPARTMENT : JOURNALISM AND MASS COMMUNICATION (REGULAR)**

<b>PROGRAMME OUTCOME</b>		
<p><i>To understand the basic facts and concepts in Mass communication and its application in daily life. It also develops a better understanding and utilization of facts and skills for various communication techniques used in different media forum.</i></p>		

<b>COURSE OUTCOME</b>		
<b>SEMESTER</b>	<b>PAPER &amp; COURSE</b>	<b>OUTCOMES</b>
<b>Semester-I</b>	<b>JMC-RC-1016 Introduction to media and Communication</b>	This paper covers the basic idea about Communication and various theories and models included in mass communication, along with its impact on the everyday life.
<b>Semester-II</b>	<b>JMC-RC-2016 Journalism</b>	This paper covers the basic idea about News, its meaning, source, writing style, along with different forms of media forums and workings of a news room.
<b>Semester-III</b>	<b>JMC-RC-3016 Introduction to Radio</b>	This paper gives the basic idea of Electronic media, with special focus on Radio as a medium for mass communication. From different dimensions in Radio broadcasting to various formats of radio script are discussed in this paper.
<b>Semester-IV</b>	<b>DSC-1D Writing for Media</b>	It is a paper on the basics of news writing, language used in print media writing, how writing for radio is different from writing for television, script writing for both news and non-news programmes.
<b>Semester-V</b>	<b>DSE-1A Indian Society and Politics (Elective: Discipline Specific)</b>	This is an elective paper that explores the history of Indian society, its cultures and politics. The basic need of this paper is to give the students an understanding on the workings of the government, fundamental rights and duties of citizens and various legal proceedings.
	<b>GE-1 Photography Elective: Generic (EG)</b>	This is an elective paper on the idea of Photography and Photo-journalism. It gives an overview to the students on the various types of camera, different parts of a camera, role of light in creating good photographs.
<b>Semester-VI</b>	<b>DSE-1B Community Radio &amp; Rural Communication (Elective: Discipline Specific)</b>	It is an elective paper that gives a brief overview of the history and growth of Community media and the concept of Rural Communication. Here the students need to visit a nearby village to have a better understanding on the reach and access of various media in that particular rural area.
	<b>GE-2 Media Laws and Ethics Elective Generic (EG)</b>	This is an elective paper on the various laws that the media in India needs to follow and it also gives an overview of the ethics that a journalist needs to abide by while writing news. The paper also explores the various media law governing bodies in India, their role and functions.
<b>SKILL ENHANCEMENT COURSE</b>		
<b>Semester-III</b>	<b>JMC-RC-3025 Radio Programme Production</b>	It is a radio programme production practical paper. From this paper students learn the workings of a radio studio, how editing of news and non-news programmes are done in Radio. It gives a basic overview of the studio know-how.
<b>Semester-IV</b>	<b>SEC-2 Print Journalism Production</b>	This is a practical based skill enhancement paper on production stages of a newspaper, Newsroom setup, and various types of reporting, technology for production of newspaper. It basically gives an overview on writing in a newspaper and magazine.
<b>Semester-V</b>	<b>SEC-3 A/V Project Short Film Making</b>	It is a practical based skill enhancement paper on the basics of Film production, various styles of film, camera angle, shots, and technicalities related to film making. This paper gives an understanding on how a film is produced, from conception of the idea to shooting the scenes to editing the shots and adding final touches before screening of a film.

<b>Semester-VI</b>	<b>SEC-4 Advertising and Public Relations</b>	This is a skill enhancement paper on Advertising and Public Relations. It explores the various types of Advertising, the workings of advertising agencies and the new trends in Advertising. It also gives an overview on the concept of Public Relations, tools of PR and role played by PR in crisis management.
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**PROGRAMME OUTCOME AND COURSE OUTCOME****DEPARTMENT : PHILOSOPHY****PROGRAMME OUTCOME**

The primary goal of philosophy course is to study the fundamental questions of life and the world. Philosophy is widely known as the pursuit of knowledge or love for wisdom. Study of philosophy enables students to lead a more substantive and meaningful life. It provides students the abilities and opportunities to be more responsible for the interdependent world in which they find themselves. The Philosophy programme seeks to promote the development of the person as an individual and as a meaningful contributor to the society. Moreover, philosophical training is intrinsically as well as extrinsically valuable. It seeks to foster in students the skills they need to develop, establish, reconstruct and evaluate arguments in any field. Philosophical training also helps students seek general explanatory principles, reflect upon what really matters, look for alternatives to widely accepted views, and learn to distinguish what is significant from what is not. Students will develop ability in critical thinking and understanding of concepts of right, wrong, good and bad and an understanding of moral principles and their application in everyday life.

**PROGRAMME SPECIFIC OUTCOME**

The study of philosophy in graduate level tries to develop in students a sense of the value and limits of philosophy, a reflective attitude and sensitivity to the difficulties and complexities of philosophical judgments, and a life-long commitment to learning and inquiry. The course acquaints students with Greek Philosophy, Indian and Western Philosophy, Ethics, Philosophy of Religion, Empiricism, Political Philosophy and Social Philosophy, Analytic Philosophy, Logic etc. Students also become familiar with some of the major figures and schools of thought in the intellectual tradition, and develop an appetite for further study and learning.

**COURSE OUTCOME (UG-CBCS)****SEMESTER I (HONOURS)**

<b>PAPER</b>	<b>COURSE</b>	<b>OUTCOMES</b>
<b>PHI-HC-1016</b>	<b>Core I Indian Philosophy I</b>	From this paper students get knowledge about the ancient Indian Texts- Vedas, Upanisads and Bhagavadgita- their meanings and different divisions etc. Students are acquainted with the development of Indian Philosophy- its nature, scope and characteristics, schools of Indian Philosophical system especially the nastika schools i.e. Carvaka, Jainism and Buddhism and also the schools of Buddhism.
<b>PHI-HC-1026</b>	<b>Core II- Logic-I</b>	Students get knowledge of logical reasoning and testing of them in Aristotelian and Modern Symbolic logic.

**SEMESTER II (HONOURS)**

<b>PHI-HC-2036</b>	<b>Core III Greek Philosophy</b>	This paper helps students to acquaint themselves with the pre-Socratic Philosophers and their philosophical doctrines such as water philosophy of Thales, Philosophy of Flux of Heraclitus, and Atomism of Democritus etc. It also acquaints students with the philosophy of the Sophists, Socrates' method and his concept of virtue, Plato's theory of forms, his concept of knowledge and opinion as well as Aristotle's classification of cause, his concept of actuality and potentiality, form and matter.
<b>PHI-HC-2046</b>	<b>Core IV- Logic-II</b>	Students will be acquainted with the development of symbolic logic from its traditional form, the uses of symbols in logic, the concept of variables and constant, types of logical connectives, the concept of truth table and truth function, construction of truth table. Students will also learn how to translate an ordinary sentence into a strict logical form, the technique of formal proof of validity in determining the validity of an argument, modern classification of proposition and the symbolization of universal and existential propositions.

**SEMESTER III (HONOURS)**

<b>PHI-HC-3056</b>	<b>Core V Western Philosophy : Descartes to Hegel</b>	This course enables students to know the Rationalists philosophers and the Empiricists philosophers and their philosophical doctrines such as Descartes' method of doubt, mind-body dualism, Spinoza's substance,
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		Leibnitz' Monadology and Pre-established Harmony, Locke's criticism of innate ideas, primary and secondary qualities, his theory of substance, Kant's concept of space and time categories, Hegel's dialectical method and Absolute Idealism.
PHI-HC-3066	Core VI Indian Philosophy II	This paper imparts students the knowledge of Vedic schools of Indian Philosophy and their different philosophical theories such as Purusa and Prakrti of Sankhya, the theory of Satkaryavada, Nyaya's division of perception and inference, Vaisesika's seven categories (padarthas) and its atomic theory, Mimamsa's pramanas etc. Students are also acquainted with Sankara and Ramanuja's philosophy of Brahman, Atman etc. And also Sankaradeva's philosophy of God and Bhakti.
PHI-HC-3076	Core VII- Ethics	Students are acquainted with the meaning, nature and scope of Ethics and the relationship of Ethics with other disciplines of study, object of moral judgment and moral obligations, the postulates of morality, concept of deontological and teleological ethics, virtue ethics of Aristotle, Kant's deontological ethics, utilitarianism of Mill and Bentham, different theories of Punishment, the concept of professional ethics and environmental ethics, and the study of the law of karma, varna-asrama dharma, Buddhists pancasila, Jaina's Triratna and its other related topics.
<b>SEMESTER IV (HONOURS)</b>		
PHI-HC-4086	Core VIII- Contemporary Indian Philosophy	The paper makes students aware about the philosophical thoughts of different Contemporary Indian Philosophers such as Aurobindo, Radhakrishnan, Gandhi and Vivekananda.
PHI-HC-4096	Core IX- Philosophy of Religion	The paper helps students to understand the critical examination of religion and to understand contemporary challenges to religion.
PHI-HC-4106	Core X- Political and Social Philosophy	With this paper students are able to understand the present day situation of society and politics and the different challenges of the present society.
<b>SEMESTER V (HONOURS)</b>		
PHI-HC-5116	Core XI- Analytic Philosophy	This paper acquaints students with the analytic philosophy of Moore, Russell, Wittgenstein and their major philosophical theories.
PHI-HC-5126	Core XII- Phenomenology and Existentialism	The paper helps in understanding of the phenomenological and existential theories of Kierkegaard, Sarte, Heidegger and Husserl.
<b>SEMESTER V (ELECTIVE DSE)</b>		
PHI-HC-5016	Philosophy of Upanishads	It gives the Upanishadic interpretations about the general social conditions, ultimate reality and Individual.
PHI-HC-5026	Philosophy of Gita	It introduces the basic ideas and theories of the Gita.
PHI-HC-5036	Isa Upanishad with Shankara Bhasya (Textual study)	Students can get a philosophical discussion about self (Atman) which focuses on non-dualism (advaita).
<b>SEMESTER VI (HONOURS)</b>		
PHI-HC-6136	Core XIII- Philosophy of Mind	The paper enables students to understand the Philosophy of Mind such as Cartesian Dualism, Parallelism, Occasionalism and other related theories.
PHI-HC-6146	Core XIV- Meta Ethics	Students get the ethical concepts such as Meta Ethics, Normative Ethics and the theories of different moral philosophers' viz. Moore, Ayer, Stevenson, R. M. Hara.
<b>SEMESTER VI (ELECTIVE DSE)</b>		
PHI-HC-6046	Western Philosophy (Textual Study)	It acquaints the students with Plato's Republic, Hegel's Phenomenology of Spirit, Sartre's Existentialism and Humanism etc.
PHI-HC-6056	Philosophy of Language	Enables the students to understand the nature of language, the relations between language, language users and the world.
PHI-HC-6066	Applied Ethics	It teaches how students can apply the moral considerations in the practical world.

REGULAR WITH PHILOSOPHY (UG-CBCS)			
SEMESTER	PAPER	COURSE	OUTCOME
I	DSC 1A	PHI-RC-1016 GE 1: General Philosophy	Makes students know what the primary sources of human knowledge are, how can they testify the truth of propositions or statements, about the existence of God and its relation with the world.
II	DSC 1B	PHI-RC-2026 GE 2:Indian Philosophy	Students get an ability to search for the truth through thinking and speculation about life and reality. After completion of this paper students get acquainted with philosophical teachings of Buddhism, Jainism, Sankhya, Nyaya, Sankara and Ramanuja.
III	DSC 1C	PHI-RC-3036 GE 3:Ethics	It introduces students with the preliminary concepts of ethics like nature and scope of ethics, objects of moral judgment etc. along with ethics of Aristotle, Kant, Bentham and Mill. Apart from theories of punishment students learnt to know some new concepts like professional and environmental ethics. This paper focuses on different ethical principles from Indian perspective.
IV	DSC 1D	PHI-RC-4046 GE 4:Logic	Gives the fundamental concepts of logic like propositions, argument, truth and validity. Apart from Aristotelian logic this paper focuses on symbolic and propositional logic.
V	DSE 1A	Contemporary Indian Philosophy	Enables the students to know about the philosophical thinking of the great Indian thinkers about the human life and reality.
VI	DSE 1B	Philosophy of Religion	After the completion of this paper students will be able to know how they can see the religious view- points scientifically.





**PROGRAMME OUTCOME AND COURSE OUTCOME  
SUBJECT : BOTANY**

Paper Code & Course Content	B.Sc. I Semester
	<p><b>Programme Outcome (PO)</b>  <b>PO-1.</b> The programme is designed to give an in depth knowledge of lower cryptogams- their structure, physiology, life cycles and economic importance.  <b>PO-2.</b> It also aims to provide basic concepts on the biomolecules and cell biology.  <b>PO-3.</b> The programme also encompasses hands on practical work related to microbiology, phycology, cell biology and biochemistry.</p>
<b>B.Sc. Semester- I (Hons.)</b>	
<p><b>BOT HC 1016 (Theory)</b>  <b>Phycology and Microbiology</b></p>	<p><b>Course Outcome (CO)</b>  <b>CO-1.</b> The learner acquires knowledge on the microbial world including Microbial Nutrition, Growth and Metabolism.  <b>CO-2.</b> The learner is able to acquire overview of viruses- their physiochemical and biological characteristics as well as replication. Knowledge on the basic DNA and RNA viruses is also acquired. sub-viral agents like viroids and prions are also touched upon.  <b>CO-3.</b> The learner is also able to have in-depth knowledge on the discovery, general characters, cell structure and nutritional types of Bacteria. Moreover, the course also gives opportunity to gather information on genetic recombination of bacteria.  <b>CO-4.</b> General account of Archaeobacteria, Actinomycetes, Mycoplasma, Rickettsia, Chlamydiae and Sphaeroplasts is also acquired.  <b>CO-5.</b> The course gives an overview of the scope of microbes in industry and environment. The student learns the significance of viruses in research, vaccines, medicine and diagnostics, role in plant diseases and the importance of bacteria in agriculture and alcohol and antibiotic production.  <b>CO-6.</b> The learner acquires knowledge on general characteristics, ecology and distribution, range of thallus organization, cell structure and pigments of Algae. Information on Fritsch's and Lee's Classification system of Algae is also acquired.  <b>CO-7.</b> Ecology, Thallus organization, Cell structure, Reproduction and Life cycles of various algal groups namely Cyanophyta, Xanthophyta, Chlorophyta, Charophyta, Bacillariophyta, Phaeophyta and Rhodophyta along with selected representative genera is also thoroughly learnt.  <b>CO-8.</b> Role of algae in the environment, agriculture, biotechnology and industry as well as economic importance of Diatoms is learnt.</p>
<p><b>BOT HC 1016</b>  <b>Phycology and Microbiology</b>  <b>(Practical)</b></p>	<p><b>Course Outcome (CO)</b>  <b>CO-1.</b> The course gives opportunity to study bacteria, binary fission, endospore, conjugation, root nodule, T-Phage and TMV, Lytic and Lysogenic cycles through Electron Micrographs, Photographs or Permanent Slides.  <b>CO-2.</b> Gram's staining and Endospore staining techniques are learnt.  <b>CO-3.</b> The technique of isolation of soil microflora is learnt.  <b>CO-4.</b> The course gives opportunity to study vegetative and reproductive structures of algal genera (<i>Nostoc</i>, <i>Volvox</i>, <i>Oedogonium</i>, <i>Chara</i>, <i>Vaucheria</i>, <i>Ectocarpus</i>, <i>Fucus</i> and <i>Polysiphonia</i>) as well as <i>Prochloron</i> through electron micrographs and slides.</p>
<p><b>BOT-HC-1026 (Theory)</b>  <b>Biomolecules and Cell</b>  <b>Biology</b></p>	<p><b>Course Outcome (CO)</b>  <b>CO-1.</b> The course provides basic concepts of biomolecules like carbohydrates, proteins, lipids, nucleic acid and different aspects of cell biology.  <b>CO-2.</b> The course inculcates knowledge about different chemical bonds along with the importance and various biochemical functions of various biomolecules.  <b>CO-3.</b> The learner will acquaint themselves the application of laws of thermodynamics in biological living system.  <b>CO-4.</b> It also enhances the understanding capability in regard to the structure and functioning of enzymes.  <b>CO-5.</b> The learner is expected to acquire complete knowledge of prokaryotic and eukaryotic cell as well as the structure of cell wall and plasma membrane along with</p>

	<p>the different endomembrane system of the cell.</p> <p><b>CO-6.</b> The learner is expected to acquire fundamental knowledge of mitosis and meiosis along with the regulation of cell cycle.</p>
<b>BOT-HC-1026 (Practical)</b> <b>Biomolecules and Cell Biology</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO 1.</b> The course provides knowledge for carrying out qualitative tests for reducing and non-reducing sugars, lipids and proteins.</p> <p><b>CO 2.</b> The learner will acquire the knowledge for cell counting of yeast/pollen grains by using haemocytometer.</p> <p><b>CO 3.</b> The learner is expected to acquire practical knowledge in regard to study of epidermal peel mount of supplied specimen besides study of protoplasmic streaming through demonstration.</p> <p><b>CO 4.</b> It also enables the students for study of plasmolysis and deplasmolysis of plant cell sap.</p> <p><b>CO 5.</b> The course also provides opportunity to learn various stages of mitosis and meiosis through demonstration.</p>
<b>B.Sc. Semester- I (HG/RC)</b>	
<b>BOT-HG/RC-1016 (Theory)</b> <b>Biodiversity (Microbes, Algae, Fungi &amp; Archegoniate)</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO–1.</b> To know general account of Viruses including DNA virus (T-phage), RNA virus (TMV) and also their economic importance.</p> <p><b>CO–2.</b> To gain knowledge about discovery, general characteristics, cell structure; reproduction and economic importance of bacteria.</p> <p><b>CO -3.</b> To know the general characteristics, ecology, distribution, range of thallus organization, reproduction, classification and economic importance of algae.</p> <p><b>CO–4.</b> To understand the morphology and life-cycles of <i>Nostoc</i>, <i>Chlamydomonas</i>, <i>Oedogonium</i>, <i>Vaucheria</i>, <i>Fucus</i>, <i>Polysiphonia</i>.</p> <p><b>CO–5.</b> To know the general characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification of fungi;</p> <p><b>CO–6.</b> To gain knowledge about general characteristics, ecology and significance, life cycle of True Fungi such as <i>Rhizopus</i> (Zygomycota) <i>Penicillium</i>, <i>Alternaria</i> (Ascomycota), <i>Puccinia</i>, <i>Agaricus</i> (Basidiomycota).</p> <p><b>CO–7.</b> To know the general account, reproduction and significance of lichens;</p> <p><b>CO–8.</b> To gain knowledge about mycorrhiza (ectomycorrhiza and endomycorrhiza) and their significance.</p> <p><b>CO–9.</b> To know unifying features transition to land habit and alternation of generations of archegoniates.</p> <p><b>CO–10.</b> To understand the general characteristics, adaptations to land habit, Classification, Range of thallus organization of bryophytes.</p> <p><b>CO–11.</b> To know the classification (up to family), morphology, anatomy and reproduction of <i>Marchantia</i> and <i>Funaria</i>.</p> <p><b>CO–12.</b> To know the ecology and economic importance of bryophytes with special mention of <i>Sphagnum</i>.</p> <p><b>CO–13.</b> To gain knowledge about general characteristics, classification and ecological and economic importance of Pteridophytes including early land plants (<i>Cooksonia</i> and <i>Rhynia</i>).</p> <p><b>CO–14.</b> To know the morphology, anatomy, reproduction and classification (up to family) of <i>Selaginella</i>, <i>Equisetum</i> and <i>Pteris</i>.</p> <p><b>CO–15.</b> To know the heterospory and seed habit &amp; stelar evolution. of pteridophytes.</p> <p><b>CO–16.</b> To gain the knowledge about general characteristics, classification, ecological and economic importance of gymnosperm.</p> <p><b>CO–17.</b> To know about the morphology, anatomy, reproduction and classification (up to family), of <i>Cycas</i> and <i>Pinus</i>.</p>
<b>BOT-HG/RC-1016 (Practical)</b> <b>Biodiversity (Microbes, Algae, Fungi &amp; Archegoniate)</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> To procure practical knowledge on T-Phage and TMV, Lytic and Lysogenic Cycle of viruses through EM/Model/Line drawing/Photograph.</p> <p><b>CO–2.</b> To obtain practical observation of different types and reproduction (binary</p>

	<p>fission and conjugation) of bacteria including structure of root nodule from temporary/permanent slides and photographs.</p> <p><b>CO-3.</b> To understand the gram staining procedure for study of bacteria.</p> <p><b>CO-4.</b> To gain practical knowledge on vegetative and reproductive structures of <i>Nostoc</i>, <i>Chlamydomonas</i>, <i>Oedogonium</i>, <i>Vaucheria</i>, <i>Fucus</i> and <i>Polysiphonia</i> through temporary preparations permanent slides and electron micrograph.</p> <p><b>CO-5.</b> To acquire practical knowledge of asexual stage and sexual structures of <i>Rhizopus</i> and <i>Penicillium</i> from temporary mounts and permanent slides.</p> <p><b>CO-6.</b> To gain practical knowledge of different spores found in <i>Puccinia</i> through tease mount/section, permanent slides and herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves.</p> <p><b>CO -7.</b> To obtain practical knowledge on gills, button and full grown stage of <i>Agaricus</i> (mushroom) by observing and sectioning preserved specimen.</p> <p><b>CO- 8.</b> To understand growth forms of lichens (crustose, foliose and fruticose) from live or preserved specimen.</p> <p><b>CO-9.</b> To understand mycorrhiza (ectomycorrhiza and endo mycorrhiza) from photograph.</p> <p><b>CO – 10.</b> To gain practical knowledge of external and internal structure of thallus, rhizoid, scales, gemma, antheridiophore, and archegoniophore of <i>Marchantia</i> by preparing w.m. and from permanent slides.</p> <p><b>CO – 11.</b> To understand external and internal morphology of leaf, rhizoid, operculum, peristome, annulus, spores of <i>Funaria</i> by preparing w.m. slides (temporary slides) and also understand external and internal morphology antheridial and archegonial head of <i>Funaria</i> from permanent slides.</p> <p><b>CO – 12.</b> To gain practical knowledge on external and internal morphology of leaf (with ligule), stem, strobilus, microsporophyll and megasporophyll of <i>Selaginella</i> by preparing w.m. slides (temporary slides) and also understand internal structure of strobilus of <i>Selaginella</i> from permanent slides.</p> <p><b>CO – 13.</b> To understand the external and internal structure of stem (internode) and reproductive structure (strobilus, sporangiophore, spores) of <i>Equisetum</i> by making temporary slides and also gain practical knowledge of internal structure of rhizome of <i>Equisetum</i> from permanent slide.</p> <p><b>CO – 14.</b> To gain practical knowledge on external and internal structure of rachis, rhizome and reproductive structure (sporophyll, sporangium, spore) of <i>Pteris</i> by preparing w.m. slide (temporary slides) and also understand structure of prothallus with sex organs and young sporophyte of it from permanent slides.</p> <p><b>CO – 15.</b> To understand external morphology (coralloid roots, bulbil, leaf) and internal morphology (coralloid root, rachis, leaflet, microsporophyll, spores) of <i>Cycas</i> with the help of making temporary slides and also get knowledge on internal structure of root and ovule of <i>Cycas</i> from permanent slide.</p> <p><b>CO – 16.</b> To understand external morphology (long and dwarf shoot) and internal morphology (needle, stem, male cone, microsporophyll, microspore) of <i>Pinus</i> with the help of making temporary slides and also know the internal structure of stem and female cone of it (from permanent slide)</p>
<b>B.Sc. II Semester</b>	
	<p><b>Programme Outcome (PO)</b></p> <p><b>PO-1.</b> The programme is so designed that learner will know the present fungal diversity which exists along with thallus organization, life cycle, disease cycle, symptom etc.</p> <p><b>PO-2.</b> The programme provides opportunity to know role of fungi in food industry, pharmaceutical industry, agriculture etc.</p> <p><b>PO-3.</b> The programme will help the learner to know various diseases caused by fungi, bacteria, viruses.</p> <p><b>PO-4.</b> Programme provides scope to understand the characteristic features of various groups included under archegoniate along with ecological and economic significance.</p>
<b>B.Sc. II Semester (Honours)</b>	

<b>BOT-HC-2016 (Theory)</b> <b>Mycology and</b> <b>Phytopathology</b>	<b>Course Outcome (CO)</b> <b>CO-1.</b> The course provides scope to study various aspects of fungi which is regarded as one of the important biological kingdoms. <b>CO-2.</b> Learner is expected to acquaint various topics about fungi including their recent classification. <b>CO-3.</b> It provides opportunity to learn various harmful and useful roles played by different genera of fungi. <b>CO-4.</b> Learners will able to know the application of fungi in different fields like biotechnology, food and pharmaceutical industries, medicine production, agriculture as biofertilizer, as biological controlling agents of disease etc.as well as mycotoxins. <b>CO-5.</b> The course also enable the learner to have some basic knowledge related to phytopathology which includes disease cycle, host-pathogen relationship, disease symptoms, disease control methods, role of quarantine etc.
<b>BOT-HC-2016 (Practical)-</b> <b>Mycology and</b> <b>Phytopathology</b>	<b>Course Outcome (CO)</b> <b>CO-1.</b> This course aims to covers the study of vegetative and reproductive structure/fruited bodies of some genera of main fungal groups with the help of temporary mounts, permanent slides or photographs. <b>CO-2.</b> Learners are expected to study different forms of lichen, their thallus including reproductive structures and also mycorrhizae through specimens, slides or photographs. <b>CO-3.</b> It provides scope to the learner to know about the applied aspects of fungi in various fields through photographs or mounts. <b>CO-4.</b> It also provides scope for the learners to collect and observe various locally available diseased plant specimens by preparing herbarium of diseased specimens and also bottle specimens. <b>CO-5.</b> This enables the learners to have a closer view of different symptoms of plant diseases caused by different pathogens.
<b>BOT-HC-2026 (Theory)</b> <b>Archegoniate</b>	<b>Course Outcome (CO)</b> <b>CO-1.</b> The course aims to get acquainted with different groups included in archegoniate like bryophytes ( <i>Riccia</i> , <i>Marchantia</i> , <i>Anthoceros</i> , <i>Sphagnum</i> and <i>Polytrichum</i> ), pteridophytes ( <i>Psilotum</i> , <i>Lycopodium</i> , <i>Selaginella</i> , <i>Equisetum</i> , <i>Pteris</i> and <i>Marsilea</i> ), gymnosperms( <i>Cycas</i> , <i>Pinus</i> , <i>Ginkgo</i> and <i>Gnetum</i> ) along with their characteristics (morphological, anatomical and reproductive). <b>CO-2.</b> It gives an opportunity of learners to study various classification of different groups included archegoniate. <b>CO-3.</b> Learners are expected to learn various adaptive features of primitive plants to land habit during the course of evolution along with early land plants( <i>Cooksonia</i> and <i>Rhynia</i> ). <b>CO-4.</b> It helps the learners to know reproduction and evolutionary trends in bryophytes ( <i>Riccia</i> , <i>Marchantia</i> , <i>Anthoceros</i> , <i>Sphagnum</i> and <i>Polytrichum</i> ). <b>CO-5.</b> It provides learners to know about various concepts like apogamy and apospory, heterospory and seed habit, telome theory besides stelar evolution. <b>CO-6.</b> The learner is expected to acquire brief idea about ecological and economic importance of bryophytes, pteridophytes, gymnosperms.
<b>BOT-HC-2026 (Practical)</b> <b>Archegoniate</b>	<b>Course Outcome (CO)</b> <b>CO-1.</b> It provides scope to study different groups under archegoniate like bryophytes ( <i>Riccia</i> , <i>Marchantia</i> , <i>Sphagnum</i> , <i>Polytrichum</i> ), pteridophytes ( <i>Lycopodium</i> , <i>Selaginella</i> , <i>Equisetum</i> , <i>Pteris</i> , <i>Marsilea</i> ), gymnosperms ( <i>Cycas</i> , <i>Pinus</i> , <i>Ginkgo</i> ) through temporary mounts, permanent slides, photographs etc. <b>CO-2.</b> This course gives enough scope to have practical observation of morphological and anatomical structures of thallus ( <i>Riccia</i> , <i>Marchantia</i> ), leaf ( <i>Sphagnum</i> , <i>Polytrichum</i> , <i>Lycopodium</i> , <i>Selaginella</i> , <i>Marsilea</i> , <i>Pinus</i> ), leaflets ( <i>Pteris</i> , <i>Cycas</i> ), sporophylls ( <i>Lycopodium</i> , <i>Selaginella</i> , <i>Cycas</i> ), rachis ( <i>Pteris</i> ), petiole ( <i>Marsilea</i> ), internode ( <i>Equisetum</i> ), stem ( <i>Selaginella</i> ), rhizophore ( <i>Selaginella</i> ), rhizome ( <i>Polytrichum</i> , <i>Marsilea</i> ).

	<p><b>CO-3.</b> Learners are expected to acquire practical knowledge and skills by studying various reproductive and related structures such as gemma cup (<i>Marchantia</i>), Antheridiophore and archegoniophore (<i>Marchantia</i>), antheridial and archegonial heads (<i>Polytrichum</i>), capsule (<i>Polytrichum</i>), strobilus(<i>Lycopodium</i>, <i>Selaginella</i> and <i>Equisetum</i>),Sporangiophore (<i>Equisetum</i>), sorus and prothallus (<i>Pteris</i>), sporocarp (<i>Marsilea</i>), male and female cone (<i>Cycas</i>, <i>Pinus</i>), male and female strobilus (<i>Gnetum</i>), ovule (<i>Cycas</i> and <i>Pinus</i>).</p>
<b>B.Sc. II Semester (HG/RC)</b>	
BOT-HG/RC-2016 (Theory) Plant Ecology and Taxonomy	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b>The course provides theoretical approaches to study basic concepts of ecology, various abiotic factors of environment and their roles.</p> <p><b>CO-2.</b> The course intends to deliver various adaptive features of hydrophytes and xerophytes to specific environment.</p> <p><b>CO-3.</b> The learner is expected to learn various functional aspects of ecosystem including energy flow, biogeochemical cycle, trophic organization etc. along with structure of ecosystem.</p> <p><b>CO-4.</b> It provides learners to study principal bio-geographical zones and also concept of endemism</p> <p><b>CO-5.</b> It provides the learners to know about various characters of community besides providing knowledge about ecotone and edge effect.</p> <p><b>CO-6.</b> Learners are expected to know the basics of succession along with processes involved and types.</p> <p><b>CO-7.</b> To procure an idea of identification, nomenclature and classification of plants.</p> <p><b>CO-8.</b> To gain the knowledge of the taxonomical aids such as herbarium, botanic garden, flora, keys (single access and multi-access) for taxonomic studies.</p> <p><b>CO-9.</b> To acquire the knowledge of modern trend in plant classification (taxonomy) i.e. use of several data from several discipline of botany such as palynology, cytology, phytochemistry and molecular biology in plant classification.</p> <p><b>CO-10.</b> To understand the concept of rank, categories and taxonomic groups such as species, genus, family, order, class, etc.</p> <p><b>CO-11.</b> To know botanical nomenclature and their principles and rules (ICN) such as ranks and names, binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.</p> <p><b>CO – 12.</b> To know classification and their types (artificial, natural and phylogenetic) including Bentham and Hooker (upto series) &amp; Engler and Prantl (upto series) system of classification.</p> <p><b>CO-13.</b> To procure the knowledge of biometrics and numerical taxonomy or mathematical taxonomy through characters, variations, OTUs, character weighting and coding, cluster analysis.</p> <p><b>CO – 14.</b> To understand the phenograms and cladograms (definitions and differences).</p>
BOT-HG/RC-2016 (Practical) Plant Ecology and Taxonomy	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course provides practical approaches to study of various instruments employed to study various abiotic parameters of environment.</p> <p><b>CO-2.</b> The learner will able to study adaptive features of various organs of xerophytes and hydrophytes through temporary or permanent slides,</p> <p><b>CO-3.</b> The course gives the scope of learner to undertake quantitative analysis of vegetation within the campus by quadrat method.</p> <p><b>CO-4.</b> To know the vegetative and floral characters by dissecting and observing vegetative and reproductive part of the specimen (using both simple and compound light microscope) included in families such as Brassicaceae, Solanaceae and Lamiaceae.</p> <p><b>CO-5.</b> To know the method of preservation technique (Herbarium) of plant specimen.</p>
<b>B.Sc. Semester-III</b>	
	<p><b>Programme Outcome(PO)</b></p> <p><b>PO-1.</b> The programme offers students inputs regarding employment opportunities</p>

	<p>through skill enhancement.</p> <p><b>PO-2.</b> The skill enhancement makes the learner confident about adoption of entrepreneurship through overall knowledge of the scientific production of biofertilizers for application in agriculture.</p> <p><b>PO-3.</b> The programme is so designed that the learner will know about the morphology and anatomy of various organs of angiosperms.</p> <p><b>PO-4.</b> The programme will give opportunity understand and practical knowledge of different economically important plants with their uses.</p> <p><b>PO-5.</b> The programme intended to have understanding on Mendelian genetics, extra-chromosomal inheritance, gene structure and mutations.</p>
<b>BOT-SE-3014</b> <b>Biofertilizers (SEC- I)</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course makes the learner aware of the techniques of production and mass multiplication of various biofertilizers like <i>Rhizobium</i>, <i>Azospirillum</i>, <i>Azotobacter</i>, <i>Azolla</i> and VAM.</p> <p><b>CO-2.</b> The learner knows about the various microbes used as biofertilizers and the advantages of their application in agriculture for increase in yield.</p> <p><b>CO-3.</b> The learner also acquires knowledge of the various aspects of organic farming- biocomposting, vermicomposting, green manuring as well as recycling of wastes.</p>
<b>B.Sc. Semester-III (Honours)</b>	
<b>BOT-HC-3016 (Theory)</b> <b>Morphology and Anatomy of Angiosperm</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1:</b> The course is expected to deliver various aspects of morphology of inflorescence, stamens and carpels with associated theories.</p> <p><b>CO-2:</b> The course provides scope to learn structure, function and seasonal activity of cambium with reference to secondary growth.</p> <p><b>CO-3:</b> The learner will acquire knowledge about internal organization of root, stem and leaf, epidermal outgrowths along with various tissues and tissue system.</p> <p><b>CO-4:</b> The course provides scope to learn various theories related to root apex and shoot apex organization (Apical cell theory, Histogen theory, Tunica Corpus theory, Korper-Kappe theory).</p> <p><b>CO-5:</b> The course is intended to deliver knowledge about the development and formation of periderm, rhytidome and lenticels.</p> <p><b>CO-6:</b> It provides scope to understand about sapwood and heartwood, ring and diffuse porous wood, Early and late wood along with dendrochronology.</p> <p><b>CO-7:</b> The learner is expected to know various anatomical adaptations of xerophytes and hydrophytes.</p> <p><b>CO-8:</b> It enables the learner to learn the applications of anatomy in the field of systematics, forensics and pharmacognosy.</p> <p><b>CO-9:</b> It provides the learner to study about adcrustation and incrustation, Ergastic substances. Hydathodes, cavities, lithocysts and laticifers.</p> <p><b>CO-10:</b> The course provides scope to gather basic knowledge about polarity along with various aspects of cytodifferentiation and organogenesis that occur during embryogenic development.</p>
<b>BOT-HC-3016 (Practical)</b> <b>Morphology and Anatomy of Angiosperm</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course provides enough scope for morphological study special types of inflorescence like Cyathium, Hypanthodium, Verticillaster, Hypanthium from various species.</p> <p><b>CO-2.</b> The learners are expected to learn special types of fruits like Superior fruits (<i>Dillenia</i>), Aggregate fruits (Custard apple, <i>Michelia</i>, Periwinkles, <i>Polyalthia</i>) and Multiple fruits (Pine apple, Jack fruits).</p> <p><b>CO-3.</b> It provides ample opportunity to study apical meristem of root, shoot and vascular cambium through temporary/permanent slides.</p> <p><b>CO-4.</b> Study of epidermal system: cell types, stomata types along with trichomes (non-glandular and glandular) through temporary/permanent slides from various species.</p> <p><b>CO-5.</b> It provides to gather practical knowledge and skills after studying primary and</p>

	<p>secondary growth in monocot and dicot roots as well stem with the help of temporary/permanent slides.</p> <p><b>CO-6.</b> Through this, the learner will have practical knowledge of isobilateral as well as dorsiventral leaves beside C<sub>4</sub> leaves showing kranz anatomy.</p> <p><b>CO-7.</b> Learners will able to learn about the xerophytes and hydrophytes along with anatomical adaptations through temporary/permanent slides.</p> <p><b>CO-8.</b> Study of secretory tissue such as: cavities, lithocysts and laticifers through slides.</p>
<b>BOT-HC-3026 (Theory) Economic Botany</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> To know about Centres of Origin, their importance with reference to Vavilov's work.</p> <p><b>CO- 2.</b> To understand Plant introductions, domestication and loss of crop genetic diversity.</p> <p><b>CO- 3.</b> To know the evolution of new crops/varieties and importance of germplasm diversity.</p> <p><b>CO - 4.</b> To know the origin, morphology, processing &amp; uses of Wheat and Rice.</p> <p><b>CO- 5.</b> To gain knowledge about brief account of millets.</p> <p><b>CO –6.</b> To know the origin, morphology and uses of Chick pea, Pigeon pea and fodder legumes with reference to importance to man and ecosystem.</p> <p><b>CO- 7.</b> To know the morphology and processing of sugarcane</p> <p><b>CO-8.</b> To gain knowledge about products and by-products of sugarcane industry.</p> <p><b>CO- 9.</b> To understand the morphology, propagation &amp; uses of Potato.</p> <p><b>CO–10.</b> To know the family, part used of important spices and economic importance of fennel, saffron, clove and black pepper.</p> <p><b>CO–11.</b> To understand the morphology, processing &amp; uses Tea and Coffee.</p> <p><b>CO –12.</b> To gain knowledge about general description, classification, extraction, uses and health implications of Vegetable oil and fats.</p> <p><b>CO- 13.</b> To know the botanical name, family &amp; uses of groundnut, coconut, linseed, soybean, mustard and coconut.</p> <p><b>CO–14.</b> To know the general account, extraction methods and uses of essential oil and their comparison with fatty oils.</p> <p><b>CO–15.</b> To understand tapping, processing and uses of Para-rubber.</p> <p><b>CO–16.</b> To gain knowledge about therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis.</p> <p><b>CO–17</b> To know the morphology, processing, uses and health hazards of Tobacco.</p> <p><b>CO–18.</b> To gain information about general account of timber plants with special reference to teak and pine.</p> <p><b>CO–19:</b> To know the classification of fibres on the basis of origin</p> <p><b>CO–20:</b> To understand the morphology, extraction and uses of Cotton, Coir and Jute.</p>
<b>BOT-HC-3026 (Practical) Economic Botany</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO–1.</b> To understand the useful parts of Rice from live specimen and also acquire knowledge about the presence of carbohydrate, starch, protein etc.in it through micro chemical test.</p> <p><b>CO–2.</b> To know the habit, fruit, seed structure of legumes such as bean and groundnut from live specimen and also to gain knowledge about the presence of protein, carbohydrate etc. in them through micro chemical test.</p> <p><b>CO–3.</b> To gain practical knowledge of beverages such as tea (from live specimen or herbarium) and coffee (from live specimen or herbarium and bean).</p> <p><b>CO–4.</b> To know the biological sources of oils and fats of coconut and oil from live specimen.</p> <p><b>CO–5.</b> To gain knowledge about rubber yielding plants and its manufacturing process and their products from live specimen, photograph/model of tapping and samples of rubber products.</p> <p><b>CO–6.</b> To gain knowledge about the presence of alkaloids in Neem and <i>Vinca rosea</i> Test for alkaloids: Neem, <i>Vinca rosea</i> through micro chemical test.</p> <p><b>CO–7.</b> To understand the habit of the plant (through herbarium or live specimen), lint</p>

	<p>and fuzz (through whole mount of the fibre) and gain knowledge about presence of cellulose (through micro chemical test) in Cotton.</p> <p>CO–8. To understand the habit of the plant (through herbarium or live specimen), internal structure of stem (through transverse section) and gain knowledge about presence of lignin in Jute.</p>
<b>BOT HC 3036 (THEORY) Genetics</b>	<p><b>Course Outcome (CO)</b></p> <p>CO-1. The course will provide basic concepts of genetics and evolution. CO-2. The learner will have the opportunity to know different inheritance pattern as advocated by Mendel along with deviations from the Mendelian principles and the factors responsible for it.</p> <p>CO-3. It provides a brief idea on the process/mechanisms of crossing over, linkage and mutation along with gene mapping based numerical.</p> <p>CO-4. It provides scope to learn the both classical and molecular concept of gene including cistron, racon, muton.</p> <p>CO-5. A brief knowledge on the process of evolution, speciation and factors affecting gene frequencies (mutation, genetic drift, natural selection) is learnt.</p>
<b>BOT HC 3036 (PRACTICAL) Genetics</b>	<p><b>Course Outcome (CO)</b></p> <p>CO-1. To have practical knowledge about Mendelian principles involved in genetics.</p> <p>CO-2. Various deviations from Mendel’s principles using seed ratios and probability numerical is learnt.</p> <p>CO-3. It has enabled learner to study various aspects of meiosis along with translocation with the help of photographs/temporary slide preparation.</p>
<b>B.Sc. Semester-III (HG/RC)</b>	
<b>BOT-HG/RC-3016 (Theory) Plant Physiology and Metabolism</b>	<p><b>Course Outcome (CO)</b></p> <p>CO-1. The course will provide proper understanding on plant-water relations along with the importance of transpiration and guttation in plant life.</p> <p>CO-2. The essentiality of the different mineral nutrients required for the plants, the movement of food in plants and the process of translocation is also learnt.</p> <p>CO-3. It provides an opportunity to learn the process of photosynthesis and respiration- the vital process occurring in plants.</p> <p>CO-4. It enhances the understanding of learners about the activity of enzymes in plant physiology,</p> <p>CO-5. It enables learner to know role of nitrogen in plant metabolism along with the physiological effects of different plant growth regulators.</p> <p>CO-6. It also inculcates knowledge about the different responses exhibited by plants to light and temperature.</p>
<b>BOT-HG/RC-3016 (Practical) Plant Physiology and Metabolism</b>	<p><b>Course Outcome (CO)</b></p> <p>CO-1. The course enhances the learner to have practical knowledge of plasmolysis and the effect of light on transpiration.</p> <p>CO-2. It encourages learner to determine stomatal index and stomatal frequency besides understanding how bicarbonate concentration have effect on oxygen evolution in photosynthesis.</p> <p>CO-3. It helps to know and understand the activity of catalase as well as effect of pH and enzyme concentration through demonstration.</p> <p>CO-4. It enable learner to study the phenomenon of bolting, effect of auxin on rooting, suction due to transpiration, R.Q. as well as respiration in roots through demonstration.</p>
<b>B.Sc. Semester-4</b>	
	<p><b>Programme Outcome(PO)</b></p> <p>PO-1. The programme is designed to gather knowledge about different general and core concepts of molecular biology besides hands on skills on separation and quantification of DNA.</p> <p>PO-2. The programme encourages the learners to know different concepts related to plant ecology as well as some aspects of phytogeography.</p> <p>PO 3. The programme provides theoretical as well as practical approach for study in</p>



	<p>plant systematics.</p> <p><b>PO 4.</b> The programme also offers skill enhancement course such as nursery and gardening, floriculture, IPR.</p>
<b>B.Sc. Semester-4 (Honours)</b>	
<b>BOT-HC-4016 (Theory)</b> <b>Molecular Biology</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> It gives opportunity to know about the historical perspective of nucleic acid as genetic material along with various experiments (Griffith's, Hershey &amp; Chase, Avery, McLeod &amp; McCarty, Fraenkel-Conrat's experiment).</p> <p><b>CO-2.</b> Learners will able to know historical perspective of DNA structure along with the organization of DNA in different organisms (Prokaryotes, Viruses and Eukaryotes).</p> <p><b>CO-3.</b> It gives scope to learn organelle DNA along with chromatin structure and types.</p> <p><b>CO-4.</b> The course provides opportunity to learn various models of replication of DNA (rolling circle, theta mode), various principles (bidirectional, semiconservative and semi discontinuous replication), discovery and the enzymes involved in the process.</p> <p><b>CO-5.</b> It provides understanding the concept of central dogma with associated experiments and also genetic code.</p> <p><b>CO-6.</b> It gives opportunity to have some basic concepts involved in the process of transcription (in prokaryotes and eukaryotes), translation, post-translational processing and modification of RNA.</p> <p><b>CO-7.</b> It enables to understand prokaryotic operons (lactose and tryptophan metabolism), eukaryotic transcription factors, heat shock proteins, hormones and various steps involved in protein synthesis.</p>
<b>BOT-HC-4016 (Practical)</b> <b>Molecular Biology</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The learners will attain the practical skills for DNA isolation besides quantification of DNA by using spectrophotometer through demonstration.</p> <p><b>CO-2.</b> It enables to study and have practical knowledge of various replication mechanisms of DNA through photographs,</p> <p><b>CO-3.</b> Learners will be able to understand the structure of eukaryotic and prokaryotic RNA polymerase along with spliceosome machinery through photographs.</p>
<b>BOT-HC-4026 (Theory)</b> <b>Plant Ecology and Phytogeography</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course provides learner to have some basic concepts related to field of plant ecology including levels of organization, inter-relationships between the living world and the surrounding environment, the various components and dynamism along with homeostasis mechanism.</p> <p><b>CO-2.</b> The learners are expected to know the importance of soil, its origin, formation and composition of soil along with various components- physical, chemical and biological.</p> <p><b>CO-3.</b> It enables the learner to acquire knowledge about soil profile and role of climate in soil development.</p> <p><b>CO-4.</b> The course helps the learner to know the importance of water, various forms of water that exist in the environment.</p> <p><b>CO-5.</b> It empowers the learner to have some basic knowledge about atmospheric moisture, various precipitation types (rain, fog, snow, hail, dew), hydrological cycle along with water available in the soil and water table.</p> <p><b>CO-6.</b> The learners will procure knowledge about different adaptation of plants in response to various environmental factors like light, temperature, wind and fire.</p> <p><b>CO-7.</b> The course will provide learner to understand various biotic interactions that exist in ecosystem (autotrophy, heterotrophy, symbiosis, commensalism, parasitism) along with some concepts in regard to trophic organization, food chains and webs, ecological pyramids, biomass, standing crop.</p> <p><b>CO-8.</b> The learner will get acquainted with different attributes of population, Growth curve, population regulation, r and k selection.</p> <p><b>CO-9.</b> It provides scope to learn about ecological speciation and its various types (Allopatric/Sympatric and Parapatric speciation)</p> <p><b>CO-10.</b> The course provides opportunity to acquire knowledge on various aspects of</p>

	<p>plant communities like ecological amplitude, Habitat and niche, characters (analytical and synthetic), Ecotone and edge effect.</p> <p><b>CO-11.</b> It helps the learner to know the dynamics involved in the succession processes and types besides basic concepts of climax.</p> <p><b>CO-12.</b> The learner will procure knowledge about the ecosystems structure along with different processes involved.</p> <p><b>CO-13.</b> The course provides ample scope to know about the functional aspects of ecosystem like energy flow- principles and models, Production and productivity; Ecological efficiencies; Biogeochemical cycles (Carbon, Nitrogen and Phosphorus Cycle)</p> <p><b>CO-14.</b> It enables the learner to know about phytogeography and various principles involved, Continental drift, theory of tolerance, endemism.</p> <p><b>CO-15.</b> It gives opportunity to learn major terrestrial biomes (tropical, temperate &amp; tundra) found in the globe.</p> <p><b>CO-16.</b> The course also provides opportunity to know about phytogeographical division of India along vegetation types of NE India with special reference to Assam.</p>
<p><b>BOT-HC-4026 (Practical)</b> <b>Plant Ecology and Phytogeography</b></p>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The learner will be able to handle various instruments to measure microclimatic parameters (soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and luxmeter).</p> <p><b>CO-2.</b> It provides the learner to develop skills to determine the pH of soil and water samples using pH meter.</p> <p><b>CO-3.</b> It provides scope for analysis of carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency of soil samples by rapid field tests.</p> <p><b>CO-4.</b> The course helps the learner to determine organic matter of different soil samples by Walkley &amp; Black rapid titration method.</p> <p><b>CO-5.</b> The learner will be able to determine dissolved oxygen of water samples from polluted and unpolluted sources.</p> <p><b>CO-6.</b> It enables the learner to know various morphological adaptations shown by hydrophytes and xerophytes in their respective habitat.</p>
<p><b>BOT-HC-4036 (Theory)</b> <b>Plant Systematics</b></p>	<p><b>Course Outcome (CO)</b></p> <p><b>CO -1.</b> To know the significances of plant systematic (aim and scope of taxonomy).</p> <p><b>CO-2.</b> To procure an idea of identification, nomenclature and classification of plants. Also to know the aim, objectives and principles of classification</p> <p><b>CO-3.</b> To procure the knowledge evidences in plant classification (taxonomy) i.e. use of several data from several discipline of botany such as cytology, chemistry, palynology, molecular data etc. in plant classification.</p> <p><b>CO-4.</b> To know the functions and significance of herbarium, virtual herbarium, botanic garden and e-flora.</p> <p><b>CO-5.</b> To understand the concept of categories (like species, genus and family) and hierarchy.</p> <p><b>CO-6.</b> To understand the principles and rules such as ranks and names, typification, author citation, effective and valid publication, rejection of names, principle of priority and its limitations, names of hybrids of Botanical Nomenclature.</p> <p><b>CO-7.</b> To know the history and different system of plant classification including Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series and also to know the major contribution of plant taxonomist like Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist.</p> <p><b>CO-8.</b> To know the latest modern system of classification like APG (Cladistic classification).</p> <p><b>CO-9.</b> To procure the knowledge of numerical taxonomy or mathematical taxonomy that includes principles, steps such as OTUs, character weighting coding and cluster analysis used in the construction of taxonomic group.</p> <p><b>CO-10.</b> To know the cladistics characters, cladograms and phenograms.</p>

	<p><b>CO-11.</b> To know the terms and concept of primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades.</p> <p><b>CO-12.</b> To procure the knowledge of Origin and evolution of angiosperms &amp; co-evolution of angiosperms and animals.</p> <p><b>CO-13.</b> To know the methods of illustrating evolutionary relationship (phylogenetic tree, cladogram).</p> <p><b>CO-14.</b> To know the characters (general and diagnostic) characters of plants of both dicot families (Magnoliaceae, Fabaceae, Asteraceae, Solanaceae, Acanthaceae, Lamiaceae, Euphorbiaceae) and monocot families (Orchidaceae, Musaceae, Zingiberaceae, Poaceae).</p> <p><b>CO-15.</b> To understand the evolutionary relationship (phylogeny) among the plants of different families.</p> <p><b>CO-16:</b> To know the plants of economic potential of several families.</p>
<b>BOT-HC-4036 (Practical) Plant Systematics</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> To know the vegetative and floral characters by dissecting and observing vegetative and reproductive part of the specimen(using both simple and compound light microscope) included in families such as Fabaceae, Solanaceae, Acanthaceae, Lamiaceae, Euphorbiaceae, Musaceae, Orchidaceae .</p> <p><b>CO-2.</b> To procure the knowledge of vegetation of an area and identification of plants species through field visit.</p> <p><b>CO-3.</b> To know the recent development in plant science by visiting academic or Research Institutions.</p> <p><b>CO-4.</b> To know the method of collection of plant specimen in the field.</p> <p><b>CO-5.</b> To know the method of preservation technique (Herbarium technique) of plant specimen.</p>
<b>B.Sc. Semester-4 (HG/RC)</b>	
<b>BOT-RC-4016 (Theory) Plant Anatomy and Embryology</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course helps the learner to know meristematic tissue (root and shoot apical meristem) as well as permanent tissues (simple and complex tissue).</p> <p><b>CO-2.</b> It helps the learner to know the structure of dicot and monocot root, stem and leaf.</p> <p><b>CO-3.</b> It provides proper understanding of vascular cambium (structure and function), secondary growth (in root and stem), wood (heartwood and sapwood).</p> <p><b>CO-4.</b> It enables the learners to have proper understanding of adaptive and protective systems in plants (xerophytes and hydrophytes).</p> <p><b>CO-5.</b> It encourages learner to study the structural organization of flower (anther, pollen, ovule, embryo sac).</p> <p><b>CO-6.</b> It helps to gather knowledge on Pollination and fertilization including double fertilization besides structure and dispersal mechanisms of seed.</p> <p><b>CO-7.</b> It provides proper understanding of endosperm (types, structure and functions), embryo (dicot and monocot), apomixis and polyembryony (types and practical applications).</p>
<b>BOT-RC-4016( Practical) Plant Anatomy and Embryology</b>	<p><b>CO-1.</b> It provides scope to study practically meristems through permanent slides and photographs.</p> <p><b>CO-2.</b>It provides opportunity to learn practically various tissues (parenchyma, collenchyma and sclerenchyma) and Phloem through permanent slides, photographs etc.</p> <p><b>CO-3.</b> It enables learner to study primary structure (<i>Zea mays</i>, <i>Helianthus</i>) and secondary structure (<i>Helianthus</i>) besides dicot and monocot leaf through permanent slides.</p> <p><b>CO-4.</b> Adaptive anatomy of xerophyte (<i>Nerium</i> leaf) and hydrophyte (<i>Hydrilla</i> stem) is learnt practically.</p> <p><b>CO-5.</b> Study of structure of anther (young and mature) and tapetum (amoeboid and secretory) is done through permanent slides.</p> <p><b>CO-6.</b> Various types of ovules (anatropous, orthotropous, circinotropous,</p>

	<p>amphitropous/campylotropous) is studied through permanent slides.</p> <p><b>CO-7.</b> Learner is able to understand female gametophyte/embryo sac (<i>Polygonum</i> type) and its development through permanent slides/photographs.</p> <p><b>CO-8.</b> It provides scope to observe and understand the ultrastructure of mature egg apparatus cells through electron micrographs.</p> <p><b>CO-9.</b> Learner is able to understand pollination types and seed dispersal mechanisms photographs and specimens.</p> <p><b>CO-10.</b> Learner is able to know embryo/endosperm from developing seeds through dissection.</p>
<b>BOT-SE-4024 Floriculture (SEC - I)</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course is so designed that it will upgrade the skills in the field of floriculture in regard to garden designs, flower production, packaging of flowers, landscaping.</p> <p><b>CO-2.</b> The course once completely learned will provide self-employment opportunities to the learners besides it will serve as a means of livelihood.</p>
<b>B.Sc. Semester-5</b>	
<b>B.Sc. Semester 5 (Hons.)</b>	<p><b>Programme Outcome (PO)</b></p> <p><b>PO-1.</b> The programme is designed to give an in depth knowledge of the reproductive biology of angiosperms that also includes latest developments such as <i>in vitro</i> technique of pollination and fertilization.</p> <p><b>PO-2.</b> The programme gives an over view of different aspects of plant physiology including plant water relations, physiology of flowering and plant growth regulators.</p> <p><b>PO-3.</b> The programme is intended to provide hands on experience and skills on practical in the field of embryology of angiosperms and plant physiology.</p> <p><b>PO-4.</b> The programme also embraces discipline specific courses (theory and practical) on natural resource management, horticultural practices and post-harvest technology.</p>
<b>B.Sc. Semester 5 (Honours)</b>	
<b>BOT HC 5016 (Theory) Reproductive Biology of Angiosperms (Theory)</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The learner is able to know the flower as a modified determinate shoot and the molecular and genetic aspects of flower development.</p> <p><b>CO-2.</b> The learner acquires knowledge of sporogenesis and gametogenesis of Angiosperms and also the processes of pollination, fertilization, embryo and endosperm development.</p> <p><b>CO-3.</b> The course gives an idea about palynology, pollen viability as well as abnormal features observed.</p> <p><b>CO-4.</b> The learner is able to grasp the basic concepts of self incompatibility as well as well as the <i>in vitro</i> studies related to pollination and fertilization and parasexual hybridization.</p> <p><b>CO-5.</b> The course also offers general account of polyembryony and apomixis along with their practical applications.</p>
<b>BOT HC 5016 (Practical) Reproductive Biology of Angiosperms (Practical)</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course gives ample scope to study structure and development of anther and pollen through the permanent slides/photographs/ micrographs.</p> <p><b>CO-2.</b> The learner is able to learn practically the ultrastructure and development of different types of ovules, types of embryos as well as the techniques of test tube pollination.</p> <p><b>CO-3.</b> The course gives opportunity to have hands on experience of experiments related to pollen germination and dissections of developing seeds for study of embryo and endosperm.</p>
<b>BOT-HC-5026 (Theory) Plant Physiology</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course offers proper knowledge on the different physiological processes exists in plant system.</p> <p><b>CO-2</b> It develops proper understanding on the basic plant water relation with the different associated pathways and theories.</p> <p><b>CO-3.</b> It provides knowledge about the roles and significance of different minerals essential for plants and their related pathways for the uptake of nutrients along with</p>

	<p>the movement of food.</p> <p><b>CO-4.</b> Learners will be encouraged to learn the process of translocation in the plants.</p> <p><b>CO-5.</b> The course content provides a clear concept about the roles and importance of plant growth regulators along with the mechanism involved in flowering and the functions of different plant pigments (<i>phytochrome, crytochrome and phototropins</i>).</p>
<b>BOT-HC-5026 (Practical)</b> <b>Plant Physiology</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> This course is intended to gain practical knowledge to determine osmotic potential by plasmolytic method and water potential by weight method besides studying the effects of wind velocity and light on the transpiration rate.</p> <p><b>CO-2</b> It encourages learner to determine stomatal index, stomatal frequency and area of an open stomata.</p> <p><b>CO-3</b> It provides scope to study practically the effect of light on seed germination, effect of different concentration of IAA and study of amylase activity.</p> <p><b>CO-4</b> The learner will be able to observe practically various experiments like suction due to transpiration, fruit ripening, rooting from cutting and bolting experiment through demonstration.</p>
<b>B.Sc. 5<sup>th</sup> Semester-Skill Enhancement (For RC)</b>	
<b>BOT-SE-5014</b> <b>Medicinal Botany</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course opportunities to learners to know history, scope and importance of Medicinal Plants.</p> <p><b>CO-2.</b> It provides knowledge about indigenous medicinal sciences like Ayurveda (History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used), Siddha (Origin, basis, plants used), Unani (History) along with the concept of Umoor-e- tabiya, polyherbal formulations.</p> <p><b>CO-3.</b> The learner will be able to know to conserve endangered and endemic medicinal plants, Red list criteria, <i>In situ</i> conservation (Biosphere reserves, sacred groves, National Parks), <i>Ex situ</i> conservation (Botanic Gardens, Ethno-medicinal plant Gardens).</p> <p><b>CO-4.</b> The learner is expected to learn about the propagation of medicinal plants, nursery (objectives, classification, and components), green house, and propagation techniques through cuttings, layering, grafting and budding.</p> <p><b>CO-5.</b> It provides scope to know about ethnobotany (definition, methods of study, applications) and folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India.</p> <p><b>CO-6.</b> It provides opportunity to know about the application of natural products to cure diseases (Jaundice, cardiac, infertility, diabetics, blood pressure and skin diseases).</p>
<b>BOT-SE-5024</b> <b>Plant Diversity and Human Welfare</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course provides opportunity to learn plant diversity at all levels (genetic diversity, species diversity, ecosystem level), its utility, agro-biodiversity, cultivated plant taxa, wild taxa and methodologies used for valuation.</p> <p><b>CO-2.</b> It enabled the learner to know the loss of biodiversity (at genetic, species, ecosystem level), Loss of agro-biodiversity, management of plant biodiversity (IUCN, UNEP, UNESCO, WWF, NBPGR), biodiversity legislation and conservations</p> <p><b>CO-3.</b> It provides scope to learn ways for conservation of biodiversity (at genetic, species, ecosystem level), <i>In situ</i> and <i>ex situ</i> conservation, biodiversity awareness programmes as well as sustainable development.</p> <p><b>CO-4.</b> It provides knowledge about role of plants in human welfare (forestry, avenue trees, ornamental plants, fruit crops, wood and its uses).</p>
<b>B.Sc. 5<sup>th</sup> Semester-Discipline Specific Elective (DSE) (For Honours)</b>	
<b>BOT-HE-5016 (Theory)</b> <b>DSE-1 Natural Resource Management</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course provides the learner to study natural resources (definition and types), its sustainable utilization and approaches (economic, ecological and socio-cultural).</p> <p><b>CO-2.</b> It provides scope to study land, its utilization (agricultural, pastoral,</p>

	<p>horticultural, silvicultural) as well as soil degradation and management.</p> <p><b>CO-3.</b> Water with reference to fresh water (rivers, lakes, groundwater, aquifers, watershed), marine, estuarine, wetlands as well as threats and management strategies is also learnt.</p> <p><b>CO-4.</b> Learners is expected to know about biodiversity (definition, types, significance, threats, management strategies), concept of bioprospecting, IPR, CBD, National Biodiversity Action Plan.</p> <p><b>CO-5.</b> It encourages the learner to study forest (definition, cover, depletion, management and its significance), major and minor forest products.</p> <p><b>CO-6.</b> Learner will be able to acquire knowledge about energy (renewable and non-renewable sources of energy).</p> <p><b>CO-7.</b> Various practices in resource management (EIA, GIS, Participatory Resource Appraisal, Ecological Footprint, Resource Accounting, waste management) are also learnt.</p>
<b>BOT-HE-5016 (Practical) DSE-1 Practical Natural Resource Management – Practical</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> Learners will be able to estimation solid waste generated by a domestic system (biodegradable and non-biodegradable) and its impact on land degradation.</p> <p><b>CO-2.</b> It will help the learner to develop practical skill of collection of data on forest cover.</p> <p><b>CO-3.</b> Learner will be able to measure practically dominance of woody species by DBH method.</p> <p><b>CO-4.</b> It provides opportunity for calculation and analysis of ecological footprint.</p> <p><b>CO-5.</b> Uses of GPS and GIS for mapping an area are also learnt.</p>
<b>BOT-HE-5026 DSE-2 Horticultural Practices and Post-Harvest Technology</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course is intended to acquire knowledge on horticulture (Introduction, branches, scope and importance), its role in rural economy and employment generation as well as urban horticulture and ecotourism.</p> <p><b>CO-2.</b> It provides scope to learn ornamental plants (types, classification, identification and salient features) particularly rose, marigold, gladiolus, carnations, orchids, poppies, gerberas, tuberose, sages, cacti and succulents, Indian laburnum, gulmohar, Jacaranda, <i>Lagerstroemia</i>, fishtail and areca palms, semul, coral tree.</p> <p><b>CO-3.</b> It provides opportunity to learn about fruit and vegetable crops (production, origin, identification and distribution), description of plants and their economic products as well as management and marketing of vegetable and fruit crops.</p> <p><b>CO-4.</b> Various horticultural techniques (application of manure, fertilizers, nutrients and PGRs), weed control, biofertilizers, biopesticides, Irrigation methods (drip irrigation, surface irrigation, furrow and border irrigation), hydroponics, propagation methods (asexual (grafting, cutting, layering, budding), sexual (seed propagation) are properly learnt..</p> <p><b>CO-5.</b> It also gives an idea about landscaping and garden design, planning and layout (parks and avenues), gardening traditions (Ancient Indian, European, Mughal and Japanese Gardens) as well as urban forestry.</p> <p><b>CO-6.</b> Learners will be able some basics of floriculture (Cut flowers, bonsai, commerce).</p> <p><b>CO-7.</b> Post-harvest technology including evaluation of quality traits, harvesting and handling of fruits, vegetables and cut flowers, methods of preservation and processing, as well as food irradiation and food safety is properly learnt.</p> <p><b>CO-8.</b> Disease control and management (remedial measures, nutritional management practices, crop sanitation, IPM strategies, quarantine practices) is learnt.</p> <p><b>CO-9.</b> It provides scope to learn horticultural crops-its conservation strategies and management practices.</p> <p><b>CO-10.</b> It helps the learner to field trip visits to gardens, standing crop sites, nurseries, vegetable gardens and horticultural fields.</p>
<b>B.Sc. 5<sup>th</sup> Semester (Discipline Specific Elective Paper)(Any Two) (RC)</b>	
<b>BOT-RE-5016 (Theory)</b>	<b>Course Outcome (CO)</b>

<p><b>Cell and Molecular Biology</b></p>	<p><b>CO-1.</b> The course helps the learner to understand principles of microscopy and various types (light microscopy, phase contrast microscopy, fluorescence microscopy, confocal microscopy, electron microscopy), sample preparation for light and electron microscopy.</p> <p><b>CO-2.</b> It helps the learner to understand basic concepts of cell, cell theory, prokaryotic and eukaryotic cells with components.</p> <p><b>CO-3.</b> It provides scope to understand structure and function of different cell organelles like mitochondria, chloroplast, ER, Golgi body, Lysosomes, Peroxisomes, Glyoxisomes, Nucleus, ribosome besides able to learn about DNA packaging in eukaryotes, euchromatin and heterochromatin.</p> <p><b>CO-4.</b> Structure, nature and function of Cell Membrane and Cell Wall along with membrane proteins and their functions is also learnt.</p> <p><b>CO-5.</b> An overview of cell cycle, mitosis and meiosis along Molecular checking points are also learnt.</p> <p><b>CO-6.</b> It also gives opportunity to learn and understand DNA as genetic material through experiments (Griffith's and Avery's transformation experiments, Hershey-Chase bacteriophage experiment), DNA structure and types, DNA replication (Prokaryotes and eukaryotes) and types (bidirectional, semi-conservative, semi-discontinuous, theta mode).</p> <p><b>CO-7.</b> Learner will be able to grasp the concept of transcription (in prokaryotes and eukaryotes), RNA Types (mRNA, tRNA, rRNA), RNA polymerase and types, translation (in prokaryotes and eukaryotes), genetic code.</p> <p><b>CO-8.</b> Regulation of gene expression in prokaryotes (lac operon and Tryptophan operon) and in Eukaryotes is also learnt.</p>
<p><b>BOT-RE-5016 (Practical)</b> <b>Cell and Molecular Biology</b></p>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> It helps the learner to study practically prokaryotic cells (bacteria), viruses, eukaryotic cells with the help of light and electron micrographs.</p> <p><b>CO-2.</b> It provides scope to study practically cell organelles through photomicrographs.</p> <p><b>CO-3.</b> It helps learner to study the structure of plant cell through temporary mounts.</p> <p><b>CO-4.</b> Learners will be able to study mitosis and meiosis through temporary mounts and permanent slides.</p> <p><b>CO-5.</b> Learners will be able to study and understand the process of plasmolysis and deplasmolysis by measuring cell size through micrometry.</p> <p><b>CO-6.</b> It provides opportunity to learn the structure of nuclear pore complex and special chromosomes (polytene &amp; lampbrush) either by slides, photographs.</p> <p><b>CO-7.</b> The concept of DNA packaging is learnt and understood by micrographs.</p> <p><b>CO-8.</b> Preparation of the karyotype and ideogram from given photographs is also learnt.</p>
<p><b>BOT-RE-5026 (Theory)</b> <b>Economic Botany and Biotechnology</b></p>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> To know about centres of origin, their importance with reference to Vavilov's work.</p> <p><b>CO - 2.</b> To know the origin, morphology &amp; uses of wheat.</p> <p><b>CO – 3.</b> To acquire knowledge on general account of legumes(soyabean and gram).</p> <p><b>CO–4.</b> To know the general account of spices (clove and black pepper) with reference to botanical name, family, part used, morphology and uses</p> <p><b>CO–5.</b> To understand the morphology, processing &amp; uses of beverage (Tea).</p> <p><b>CO–6.</b> To gain knowledge about general description oils and fats (groundnut).</p> <p><b>CO–7:</b> To know about the general description of fibre yielding plants (cotton) with reference to botanical name, family, part used, morphology and uses.</p> <p><b>CO-8.</b> The learner is able to understand the basics of biotechnology, plant tissue culture and techniques involved (micro propagation, haploid production, embryo &amp; endosperm culture) along with applications.</p> <p><b>CO-9.</b> The course will enables the learner to know and understand the recombinant DNA techniques like Blotting techniques (Northern, Southern and Western Blotting), DNA Fingerprinting, Molecular DNA markers (RAPD, RFLP, SNPs), DNA sequencing,</p>

	<p>PCR and Reverse Transcriptase, Hybridoma and monoclonal antibodies, ELISA and Immuno-detection, molecular diagnosis of human disease and human gene therapy.</p> <p><b>CO-10.</b> It provides opportunity to learn basics of bioinformatics (branches, aim, scope and research areas), Biological data base and the retrieval system. It will also help to gain knowledge on applications of bioinformatics, basics in proteomics and genomics and their applications in crop improvement, on molecular phylogeny as well as on drug discovery.</p>
<b>BOT-RE-5026 ( Practical ) Economic Botany and Biotechnology</b>	<p><b>Course Outcome(CO)</b></p> <p><b>CO-1.</b> It provides the scope to study economically important plants(Rice, Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut, <i>Curcuma</i>) through specimens, sections and microchemical tests.</p> <p><b>CO-2.</b> It gives opportunity to learners to be familiarized with basic equipments used in tissue culture.</p> <p><b>CO-3.</b> The course helps to study practically about another culture, somatic embryogenesis, endosperm and embryo culture, micropropagation through photographs.</p> <p><b>CO-4.</b> Different molecular techniques (PCR, Blotting techniques, AGE and PAGE) are thoroughly learnt.</p> <p><b>CO-5.</b> Techniques involved in data base searching and retrieval of sequence from databases is also learnt. Learners will develop the skill to do sequence alignment, homology and construction of phylogenetic tree <i>in-silico</i>.</p>
<b>BOT-RE-5036 (Theory) Genetics and Plant Breeding</b>	<p><b>Course Outcome(CO)</b></p> <p><b>CO-1.</b> The course gives scope to learn about heredity, life history of Mendel and his laws, modified Mendelian ratios (2:1- lethal Genes, 1:2:1- Co- dominance, incomplete dominance, 9:7; 9:4:3; 13:3; 12:3:1), pedigree analysis, Cytoplasmic Inheritance (Shell Coiling in Snail, Kappa particles in <i>Paramecium</i>, leaf variegation in <i>Mirabilis jalapa</i>, Male sterility).</p> <p><b>CO-2.</b> The learner will able to know multiple allelism, Pleiotropism, Chromosome theory of Inheritance, Sex-determination and Sex-linked Inheritance, Linkage (complete &amp; incomplete linkage, bridges experiment, coupling &amp; repulsion) and Crossing over (concept and significance, cytological proof of crossing over, recombination frequency), construction of linkage maps based on two and three factor crosses.</p> <p><b>CO-3.</b> The learner is able to learn and understand mutations (types, effects of mutagens) and Chromosomal Aberrations such Numerical chromosomal changes (Euploidy, Polyploidy and Aneuploidy) and Structural chromosomal changes (Deletions, Duplications, Inversions &amp; Translocations).</p> <p><b>CO-4.</b> Plant Breeding (Introduction and objectives), Breeding systems, achievements and undesirable consequences of plant breeding is learnt.</p> <p><b>CO-5.</b> Different methods of crop improvement (Introduction, Acclimatization, Selection methods, Hybridization) in self, cross and vegetatively propagated plants with procedure, advantages and limitations is thoroughly learnt.</p> <p><b>CO-5.</b> Non-conventional methods of crop improvement and breeding (mutations, polyploidy, distant hybridization and biotechnology) is properly understood.</p> <p><b>CO-6.</b> Inbreeding depression and heterosis (History, genetic basis and applications) is learnt properly.</p>
<b>BOT-RE-5036 ( Practical) Genetics and Plant Breeding</b>	<p><b>Course Outcome(CO)</b></p> <p><b>CO-1.</b> Mendel's laws is studied and learnt through seed ratios along with laboratory exercises in probability and chi- square.</p> <p><b>CO-2.</b> Chromosome mapping is studied and understood through point test cross data.</p> <p><b>CO-3.</b> Incomplete dominance and gene interaction is learnt practically through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).</p> <p><b>CO-4.</b> Learner is able to study practically aneuploidy (Down's, Klinefelter's and Turner's syndromes) through photographs.</p> <p><b>CO-5.</b> Translocation Ring, Laggards and Inversion Bridge is observed and understood</p>



	<p>practically through photographs/permanent slides.</p> <p><b>CO-6.</b> Different techniques involved in hybridization (Emasculation, Bagging) is understood from demonstration.</p> <p><b>CO-7.</b> Induction of polyploidy conditions in plants is learnt through demonstration only.</p>
<b>B.Sc. Semester-6</b>	
<b>BSc Semester 6 (Hons.)</b>	<p><b>Programme Outcome(PO)</b></p> <p><b>PO-1.</b> The programme is designed to give the learner knowledge on plant metabolism and plant biotechnology.</p> <p><b>PO-2.</b> The learner is also able to have information on Industrial and Environmental Microbiology with special reference to various microbial products.</p> <p><b>PO-3.</b> The programme provides opportunity to learn different analytical techniques and their applications in field of plant science.</p> <p><b>PO-4.</b> It also provides scope of Project/Dissertation work and thereby explore different possibilities.</p>
<b>BOT-HC-6016 (Theory)</b> <b>Plant Metabolism</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO 1.</b>The course provides knowledge about the different anabolic and catabolic pathways occurring in plants including various pathways of carbon assimilation and carbon oxidation along with carbohydrate lipid and nitrogen metabolism.</p> <p><b>CO-2.</b> It provides an understanding about ATP synthesis and the different pathways related to signal transduction.</p>
<b>BOT-HC-6016 (Practical)</b> <b>Plant Metabolism</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course inculcates the practical skill in the students for separation of the chlorophyll pigments, to study the effect of carbon dioxide and light intensity on the rate of photosynthesis and comparison of the rate of respiration and study the activity of lipases.</p> <p><b>CO-2.</b> It provides practical knowledge on activity of nitrate reductase, florescence by isolated chlorophyll pigments and absorption spectrum of photosynthetic pigments through demonstration.</p>
<b>BOT-HC-6026</b> <b>Plant Biotechnology (Theory)</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b>The learner has scope to know the concepts of Totipotency, Organogenesis and Embryogenesis. The learner gets hold of conceptions involved in the techniques of micropropagation, culture media composition and hormone and vitamin requirements during tissue culture.</p> <p><b>CO-2.</b> The underlying concepts and techniques of recombinant DNA technology and gene cloning are also learnt. Detailed information on the types of restriction endonucleases and their applications, technique of restriction mapping and also knowledge on prokaryotic and eukaryotic cloning vectors is gathered.</p> <p><b>CO-3.</b>The course gives scope of learning PCR mediated gene cloning, construction of DNA libraries and their screening to obtain gene of interest.</p> <p><b>CO-4.</b> Genetic engineering techniques both <i>Agrobacterium</i> mediated as well as <i>in vitro</i> techniques like electroporation, microinjection are learnt. Role of selectable markers and reporter genes in selection of transgenics is also offered to the learner.</p> <p><b>CO-5.</b>The course also gives information on the applications of plant biotechnology. The learner is able to know the applications of plant tissue culture in secondary metabolite production, haploid and triploid production as well as germplasm conservation.</p> <p><b>CO-6.</b>The course offers scope to know the techniques involved in production of transgenic crops like Bt Cotton, Flavr Savr Tomato, Golden Rice, Round Up Ready Soyabean. The role of transgenics like the Superbug in Bioremediation is also touched upon.</p> <p><b>CO-7.</b> The learner comes to know about genetically engineered products like Humulin, Human Growth Hormones as well as production of Industrial enzymes and edible vaccines.</p> <p>The aspect of Biosafety Concern is also encompassed.</p>

<b>BOT-HC-6026</b> <b>Plant Biotechnology</b> <b>(Practical)</b>	<b>Course Outcome (CO)</b> <b>CO-1.</b> The course offers to the learner the scope of studying tools and techniques of plant biotechnology mainly with the aid of photographs. <b>CO-2.</b> Micropropagation techniques, anther, embryo and endosperm culture techniques, <i>Agrobacterium</i> -mediated as well as direct gene transfer techniques like electroporation, microinjection, microprojectile bombardment is learned with the help of photographs. <b>CO-3.</b> The learner also able to know the various steps involved in production of Bt-cotton, Golden rice, Flavr Savr tomato through photographs. <b>CO-4.</b> Hands on learning on isolation of protoplast, isolation of plasmid DNA as well as restriction digestion and gel electrophoresis is also acquired. <b>CO-5.</b> The learner is also able to construct restriction maps from data provided at the completion of the course.
<b>B.Sc.6<sup>th</sup> Semester-Discipline Specific Elective(Honours)</b>	
<b>BOT-HE-6016 (Theory)</b> <b>DSE-3 Industrial and Environment Ecology</b>	<b>Course Outcome (CO)</b> <b>CO-1.</b> The course makes aware of scope of microbes in industry and environment and also bioreactors/fermenters (types, uses) and fermentation processes. <b>CO-2.</b> Microbial production of industrial products, microorganisms involved downstream processing and uses are learnt. It also provides hands on activity of microbial fermentations for the production and estimation (qualitative and quantitative) of enzyme, organic acid (citric acid or glutamic acid), alcohol (Ethanol) and antibiotic (Penicillin). <b>CO-3.</b> It provides understanding of microbial enzymes, microorganisms for industrial applications, hands on screening of microorganisms for casein hydrolysis, starch hydrolysis, cellulose hydrolysis. Large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase) is also learnt. <b>CO-4.</b> It gives opportunity to learn about microbes and quality of environment along with isolation of microorganisms from soil, air and water. <b>CO-5.</b> It provides scope to know about water pollution, role of microbes in sewage and domestic waste water treatment systems. <b>CO-6.</b> Determination of BOD, COD, TDS and TOC of water samples is also learnt. <b>CO-7.</b> Role of microbes in agriculture and remediation of contaminated soils biological fixation, mycorrhizae etc. is also learnt.
<b>BOT-HE-6016 (Practical)</b> <b>Industrial and Environment Ecology</b>	<b>Course Outcome (CO)</b> <b>CO-1.</b> Principles and functioning of different instruments used in microbiology laboratory is demonstrated properly. <b>CO-2.</b> Hands on sterilization techniques and preparation of culture media is thoroughly learnt <b>CO-3.</b> Various pure culture techniques are properly learnt through demonstration.
<b>BOT-HE-6026</b> <b>DSE-4 Analytical Techniques in Plant Sciences</b>	<b>Course Outcome (CO)</b> <b>CO-1.</b> Imaging and related techniques related to various microscopy, Utility of fluorochromes (Flow cytometry, fluorescence microscopy), Chromosome banding, FISH, chromosome painting, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching are thoroughly learned. <b>CO-2.</b> Techniques involved in cell fractionation by various centrifugation (Differential and density gradient centrifugation, sucrose density gradient, CsCl <sub>2</sub> gradient, analytical centrifugation, ultracentrifugation) are properly understood. <b>CO-3.</b> Use of Radioisotopes (auto-radiography, pulse chase experiment) and spectrophotometry in biological research is properly learnt. <b>CO-4.</b> Principle and types of Chromatography (Paper chromatography, Column chromatography, TLC, GLC, HPLC, Ion exchange chromatography, Molecular sieve chromatography, Affinity chromatography) is understood. <b>CO-5.</b> Learner is able to characterize proteins and nucleic acids by Mass spectrometry, X-ray diffraction, X-ray crystallography. Also various types of electrophoresis(AGE,

	<p>PAGE, SDS-PAGE) is also learnt.</p> <p><b>CO-6.</b>It provides scope to learn various concepts of biostatistics like data, population, samples, parameters, arithmetic mean, mode, median, Range, mean deviation, variation, standard deviation; Chi-square test.</p>
<b>BOT-HE-6026 (Practical) DSE-4 Analytical Techniques in Plant Sciences</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course provides scope to study practically the blotting techniques (Southern, Northern and Western), DNA fingerprinting, DNA sequencing, PCR through photographs.</p> <p><b>CO-2.</b>The use of ELISA is learnt through demonstration.</p> <p><b>CO-3.</b> Learner is able to separate sugars by thin layer chromatography.</p> <p><b>CO-4.</b> Technique for isolation of chloroplasts by differential centrifugation and column chromatography is properly learnt.</p> <p><b>CO-5.</b>Estimation of protein concentration is learnt through Lowry's methods.</p> <p><b>CO-6.</b> It provides scope to learn how to separate proteins using PAGE.</p> <p><b>CO-7.</b> Separation of DNA (marker) using AGE is properly understood. <b>CO-8.</b>Different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH) is properly understood</p>
<b>BOT-HE-6036 DSE-4 Project Work/ Dissertation</b>	The course provides opportunity to explore different areas of botany to work on and thereby have practical knowledge.
<b>B.Sc. Semester-6 (RC)-Skill Enhancement (Any One)</b>	
<b>BOT-SE-6014 Ethnobotany</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b>The course will help to understand about Ethnobotany (Introduction, concept, scope and objectives, relevance) as well as various plants used by the tribals (Food plants, intoxicants and beverages, Resins and oils and miscellaneous uses).</p> <p><b>CO-2.</b> Different methodology (Field work, Herbarium, Ancient Literature, Archaeological findings, temples and sacred places) used in ethnobotanical studies is learnt.</p> <p><b>CO-3.</b> Role of ethnobotany in modern medicine is thoroughly learnt.</p> <p><b>CO-4.</b> Significance of various plants in ethno botanical practices (<i>Azadiractha indica</i>, <i>Ocimum sanctum</i>, <i>Vitex negundo</i>, <i>Gloriosa superba</i>, <i>Tribulus terrestris</i>, <i>Pongamia pinnata</i>, <i>Cassia auriculata</i>, <i>Indigofera tinctoria</i>) is also understood.</p> <p><b>CO-5.</b> Role of ethnobotany in modern medicine particularly <i>Rauwolfia serpentina</i>, <i>Trichopus zeylanicus</i>, <i>Artemisia</i>, <i>Withania</i>.</p> <p><b>CO-6.</b> It helps us to know how ethnic groups play important role in in conservation of plant genetic resources.</p> <p><b>CO-7.</b> Legal aspects of Ethnobotany, Protecting the interests of ethnic groups, Biopiracy, Intellectual Property Rights and Traditional Knowledge is properly understood.</p>
<b>BOT-SE-6024 Mushroom Culture Technology</b>	<p><b>Course Outcome (CO)</b></p> <p><b>CO-1.</b> The course provides a basic introduction of mushroom, its nutritional and medicinal value, Poisonous mushrooms, edible mushrooms (<i>Volvariella volvacea</i>, <i>Pleurotus citrinopileatus</i>, <i>Agaricus bisporus</i>).</p> <p><b>CO-2.</b> Skills related to mushroom cultivation technology which includes infrastructure (substrates, polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit, water sprayer, tray, small polythene bag), pure culture (medium, sterilization, preparation of spawn, multiplication), mushroom bed preparation (paddy straw, sugarcane trash, maize straw, banana leaves) is properly learnt.</p> <p><b>CO-3.</b> Storage (short term and long term) and nutritive value (proteins - amino acids, mineral elements, carbohydrates, Crude fibre content, Vitamins is understood.</p> <p><b>CO-4.</b> Skill for preparation of various types of foods prepared from mushroom is also acquired.</p>

**B.Sc. Semester-6 (RC)-Discipline Specific Elective Papers (Any One)**

<b>BOT-RE-6016 (Theory) Analytical Techniques in Plant Sciences</b>	<b>Course Outcome (CO)</b> <b>CO-1.</b> Imaging and related techniques related to various microscopy, Utility of fluorochromes (Flow cytometry, fluorescence microscopy), Chromosome banding, FISH, chromosome painting, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching are thoroughly learned. <b>CO-2.</b> Techniques involved in cell fractionation by various centrifugation (Differential and density gradient centrifugation, sucrose density gradient, CsCl <sub>2</sub> gradient, analytical centrifugation, ultracentrifugation) are properly understood. <b>CO-3.</b> Use of Radioisotopes (auto-radiography, pulse chase experiment) and spectrophotometry in biological research is properly learnt. <b>CO-4.</b> Principle and types of Chromatography (Paper chromatography, Column chromatography, TLC, GLC, HPLC, Ion exchange chromatography, Molecular sieve chromatography, Affinity chromatography) is understood. <b>CO-5.</b> Learner is able to characterize proteins and nucleic acids by Mass spectrometry, X-ray diffraction, X-ray crystallography. Also various types of electrophoresis(AGE, PAGE, SDS-PAGE) is also learnt. <b>CO-6.</b> It provides scope to learn various concepts of biostatistics like data, population, samples, parameters, arithmetic mean, mode, median, Range, mean deviation, variation, standard deviation; Chi-square test.
<b>BOT-RE-6016 (Practical) Analytical Techniques in Plant Sciences</b>	<b>Course Outcome (CO)</b> <b>CO-1.</b> The course provides scope to study of blotting techniques (Southern, Northern and Western), DNA fingerprinting, DNA sequencing, PCR through photographs. <b>CO-2.</b> The use of ELISA is learnt through demonstration. <b>CO-3.</b> Learner is able to separate sugars by thin layer chromatography. <b>CO-4.</b> Technique for isolation of chloroplasts by differential centrifugation and column chromatography is properly learnt. <b>CO-5.</b> Estimation of protein concentration is learnt through Lowry's methods. <b>CO-6.</b> It provides scope to learn how to separate proteins using PAGE. <b>CO-7.</b> Separation of DNA (marker) using AGE is properly understood. <b>CO-8.</b> Different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH) is properly understood.
<b>BOT-RE-6026 Dissertation</b>	The course provides opportunity to explore different areas of botany to work on and thereby have practical knowledge.



**PROGRAMME OUTCOME AND COURSE OUTCOME  
DEPARTMENT : GEOGRAPHY**

**PROGRAMME OUTCOME**

*The three year Under Graduate course in Geography (Honours and Regular) equips the students with knowledge in different areas of Geography– geomorphology, oceanography, climatology, world regional geography, soil and biology, economic geography, human geography, development planning, cartography, geoinformatics, statistics.*

*The programme throws light on the importance of geography and attempts to enrich knowledge, illustrates the basic concepts as well as technical terms which are building blocks of geographic knowledge along with understanding of sophisticated models and techniques with space-time dimension. It helps to understand the technology and economic development processes of different geographic situation in brief.*

*This programme enable the students to understand the issues associated with population phenomena both in development and developing world and students to realize the population as resource and burden for a country or nation in its geographical context/framework. It also provides requisite knowledge on the various issues on development and also the planning process and to impart concepts and ideas how regional development can be attained through proper planning of the resources.*

*This programme emphasize on sensitization of climate change. It explores various aspects of climate and associated subject matter. It helps students to understand the impacts, adaptation and mitigation to climate change in the nature.*

*Students will be given exposure to the use of quantitative and qualitative techniques in geographical analysis special data. They also equip with mapping and field surveying skills as well as in the emerging field of advanced technology, i.e., Geo-informatics which include the applications of Remote Sensing, GIS and GPS.*

*This programme enables the students to development an understanding of native country; India in spatial context, along with its resource based, population, regional disparities of development and India's geographical significance special reference to North –eastern part of India in respect of its problem and prospects of development.*

**COURSE OUTCOME (HONOURS COURSE)**

<b>SEMESTER</b>	<b>PAPER &amp; COURSE</b>	<b>OUTCOMES</b>
<b>Semester I</b>	<b>GGY-HC-1016 Geomorphology</b>	The students will learn that the earth is unstable and it is undergoing constant changes due to dynamic earth's processes. The students will come to know about the meaning and scope of geomorphology as a major branch of Physical Geography. After gaining knowledge based on the contents embodied in this paper, the students will be able to realize the importance of geomorphological knowledge as applied in various developmental activities executed in different areas.
	<b>GGY-HC-1026 Cartographic Techniques</b>	Understanding the importance of various cartographic techniques in geographical study, general understanding of map type, map scale and map content and an acquaintance of different cartographic techniques for representation of various facets of physical and human geographic data of any area.
<b>Semester II</b>	<b>GGY-HC-2016</b>	The paper will be useful for students in developing ideas on human-environment issues that geographers usually address in the anthropocene. The paper will be useful for students preparing for UGC NET/SLET exams and other competitive exams including the civil services.
	<b>GGY-HC-2026 Climatology and Biogeography</b>	The paper will be useful for students in developing ideas on climate related aspects of geographical analyses. The paper will help provide theoretical insights and perspectives to students if they wish to pursue a research programme in future. Students will develop a basic understanding of the introductory concepts in biogeography. The paper be very useful for students

		preparing for UGC NET-JRF / SLET exam and other competitive exams including civil services.
<b>Semester III</b>	<b>GGY-HC-3016 Economic Geography</b>	The paper will be useful for students in developing ideas on how geographical aspects organize economic space and will offer perspectives to students if they wish to pursue a research programme. The paper will be useful for students preparing for UGC NET/SLET exams and other competitive exams including the civil services.
	<b>GGY-HC-3026 Geography of India with special reference to N.E. India</b>	The paper will be useful for students in developing understanding on Indian geography and its various dimensions. It will also be useful for students preparing for UGC NET/SLET examinations along with civil services and other competitive examinations.
	<b>GGY-HC-3036 Quantitative Methods in Geography</b>	Thorough understanding of the statistical methods and techniques used in geographical studies as well as understanding of tabulation, analysis and interpretation of geographical data.
<b>Semester IV</b>	<b>GGY-HC-4016 (Environmental Geography and Disaster Management):</b>	The paper will be useful for students in developing ideas on environmental issues that geographers usually address. The paper will be useful for students preparing for UGC NET/SLET exams and other competitive exams including the civil services.
	<b>GGY-HC- 4026 Population and Settlement Geography</b>	This paper will be useful to students to develop ideas on the issues relating to the population in relation to its environment (areas) and its consequences. It helps also basic ideas about the settlement processes in different areas-rural and urban and its processes of development in terms of both temporal and special dimensions.
	<b>GGY-HC-4036 Remote Sensing Techniques and GIS</b>	The paper remains useful for students in developing skills in spatial data analysis if they wish to pursue a research programme. The paper will be useful for students preparing for UGC NET/SLET exams and other competitive exams including the civil services.
<b>Semester V (Honours Core Course)</b>	<b>GGY-HC-5016 Social and Political Geography</b>	The students will acquire knowledge about the aspects of society, social systems as well as the components of welfare and well-being of the society. It also helps to understand the causes and remedies of social conflict of different social groups. In the course of political geography, students can get knowledge about the concepts of states and nation, their evolution in terms of social arena, causes of conflicts and their consequences between nations as well different states. It also helps to gather knowledge about how to combat against the instabilities of a country in terms of internal as well as external affairs.
	<b>GGY-HC-5026 Field Techniques in Geography</b>	This course will help students to proceed with a research problem and the steps she/he should adopt and the tools and craft to be employed for doing quality research. Students perceive fieldwork to be beneficial to their learning, because through it they experience 'geographical reality', and have deeper understanding of the subject. The students will have a chance to interact with respondents and collect data through questionnaire directly from the field. This course will develop understanding about designing and writing a field report.
<b>Semester V (Discipline Specific Elective Course)</b>	<b>GGY-HE-5056 Urban Geography</b>	The paper will be useful for students in developing ideas on how geographical factors organize urban spaces and how geographers seek to address various urban problems and issues. It will help build skills among students seeking advanced studies on urban development and planning. The paper will be very useful for students preparing for various competitive examinations including civil services.
	<b>GGY-HE-5066 Agricultural Geography</b>	This paper will be useful for students in developing ideas about agricultural practices and their distribution and characteristics. This paper will also be useful to the students in understanding the world agricultural systems. This paper will help develop understanding of location of agricultural activities and associated contemporary problems and challenges.

<b>Semester VI (Honours Core Course)</b>	<b>GGY-HC-6016 Geographical Thought</b>	The paper will be useful for students in understanding perspectives on the development and contemporary trends in geography and its systematic study. The paper will be useful for students preparing for UGC NET/SLET exams and other competitive exams including the civil services.
	<b>GGY-HC-6026 Research Methods in Geography and Project Work</b>	This course will help the students to proceed with a research problem and the steps she/he should adopt and the tools and craft to be employed while doing quality research. This course will help students to proceed with a research problem and the steps she/he should adopt and the tools and craft to be employed which doing quality research. Students perceive fieldwork to be beneficial to their learning because through it they experience 'geographical reality'; have deeper understanding of the subject. The students will have a chance to interact with respondents and collect data through questionnaire directly from the field. It also develops understanding about designing and writing a field report.
<b>Semester VI (Discipline Specific Elective Course)</b>	<b>GGY-HE-6046 Hydrology</b>	After completion of this course the students will be able to speak on the basic concepts of hydrology and its application in river basin studies. Students will also have a practical orientation of the concepts both in laboratory and in the field.
	<b>GGY-HE-6066 Geography of Resources and Development</b>	This paper will be useful to students in developing ideas on different aspects of resources, and the linkages with development issues that geographers usually address. This paper will also be useful for students preparing for different competitive examinations including the civil services.

**COURSE OUTCOME (GENERIC ELECTIVE COURSE FOR HONOURS AND REGULAR CORE COURSE)**

<b>SEMESTER</b>	<b>PAPER &amp; COURSE</b>	<b>OUTCOMES</b>
<b>Semester I</b>	<b>GGY-HG-1036 or GGY-RC-1016 Physical Geography</b>	The students will learn that the earth is unstable and it is undergoing constant changes due to dynamic earth's processes. The students will come to know about the meaning and scope of geomorphology, which a major branch of Physical Geography. After gaining knowledge based on the contents embodied in this paper, the students will be able to realize the importance of geomorphological knowledge as applied in various developmental activities executed on the land and over the earth's surface.
<b>Semester II</b>	<b>GGY-HG-2016 or GGY-RC-2016 Human Geography</b>	The paper will be useful for students in developing ideas on human-environment issues that geographers usually address in the anthropocene. The paper will be useful for students preparing for UGC NET/SLET exams and other competitive exams including the civil services.
<b>Semester III</b>	<b>GGY-HG-3016 or GGY-RC-3016 Economic Geography</b>	This paper will be useful for the students to develop ideas on how geographical factors organize economic space, and to acquire knowledge about spatial patterns of various economic activities on the earth.
<b>Semester IV</b>	<b>GGY-HG-4016 or GGY-RC-4016 Geography of India and N.E. India</b>	The paper will be useful for students in developing understanding on Indian geography and its various dimensions. It will also be useful for students preparing for UGC NET/SLET examinations along with civil services and other competitive examinations.

**COURSE OUTCOME (REGULAR ELECTIVE COURSE)**

<b>Semester V</b>	<b>GGY-RE-5026 Quantitative and Cartographic Techniques in Geography</b>	Understanding the importance of various cartographic techniques in geographical study, general understanding of map type, map scale and map content and an acquaintance of different cartographic techniques for representation of various facets of physical and human geographic data of any area. Thorough understanding of the statistical methods and techniques used in geographical studies as well as understanding of tabulation, analysis and interpretation of geographical data.
	<b>GGY-RE-5036 Population and Settlement</b>	This paper will be useful to students to develop ideas on the issues relating to the population in relation to its environment (areas) and its consequences. It helps also basic ideas about the settlement processes in different areas-rural and urban and its

	<b>Geography</b>	processes of development in terms of both temporal and special dimensions. The paper will also be useful for students in developing ideas about spatio-temporal changes in the characteristics of population and settlement and the factors associated with them. The paper will be useful for students preparing for various competitive exams including the civil services.
<b>Semester V</b>	<b>GGY-RE-6016 Social and Political Geography</b>	The students will acquire knowledge about the aspects of society, social systems as well as the components of welfare and well-being of the society. It also helps to understand the causes and remedies of social conflict of different social groups. In the course of political geography, students can get knowledge about the concepts of states and nation, their evolution in terms of social arena, causes of conflicts and their consequences between nations as well different states. It also helps to gather knowledge about how to combat against the instabilities of a country in terms of internal as well as external affairs.
	<b>GGY-RE-6036 Geography of Health</b>	Understanding of the concept of human health and health care from the perspective of geography. Acquiring knowledge about factors influencing human health and occurrence of diseases in varying ecological settings. Providing useful information about the impact of global climate change on human health and occurrence of various diseases in different ecological settings in India.
<b>COURSE OUTCOME (SKILL ENHANCEMENT COURSE)</b>		
<b>Semester III</b>	<b>GGY-SE-3054 or GGY-SE-3034 Thematic Cartography</b>	Understanding the importance of various techniques of preparation of maps in Geographical study, General understanding of preparation of different types of plan and maps and an acquaintance of different cartographic techniques for representation of various facets of earth's surface.
<b>Semester IV</b>	<b>GGY-SE-4044 Advanced Statistical Techniques for Spatial Analysis (For Honours Course)</b>	It provides general understanding of geographical data and application of various statistical measures for their meaningful analysis. Acquiring basic knowledge about probability and normal distributions and their applications for sample data collection and analysis. It also helps to understand the patterns and processes associated with various geographical phenomena through application of different statistical techniques.
	<b>GGY-SE-4034 Remote Sensing, GIS and GPS (For Regular Course)</b>	The paper will provide students with technical skills in data interpretation and analysis when using remote sensing data. The paper will be useful for students seeking employment in the public/private sector in agencies using spatial/remote sensing datasets. The paper also useful for students in developing skills in spatial data analysis if they wish to pursue a research programme. The paper will be useful for students preparing for different competitive examinations including the civil services.
<b>Semester V</b>	<b>GGY-SE-5044 Computer aided Data Analysis and Graphical Presentation (For Regular Course)</b>	This paper shall prove to be very useful to the students in developing skills in data analysis and graphical presentation using various software including MS-Excel. This paper will also be useful for students preparing for different competitive exams including the civil services.
<b>Semester VI</b>	<b>GGY-RE-6044 Field Techniques and Project work</b>	This course will help students to proceed with a research problem and the steps she/he should adopt and the tools and craft to be employed for doing quality research. Students perceive fieldwork to be beneficial to their learning, because through it they experience 'geographical reality', and have deeper understanding of the subject. The students will have a chance to interact with respondents and collect data through questionnaire directly from the field. This course will develop understanding about designing and writing a field report.





**PROGRAMME OUTCOME AND COURSE OUTCOME  
DEPARTMENT : : INSTRUMENTATION SCIENCE**

**PROGRAMME OUTCOME**

*Instrumentation as a subsidiary subject in undergraduate level is not only equipped them with the principle of modern instruments used in their experiments but also help the students to design their experiments according to their need. This program has developed skilled graduates in the field of Instrumentation. It gives students a good combination of hardware and software domains and also gives a very good base in electronics, electrical and control fields. Any manufacturing demands automation which requires sensing, monitoring and controlling of variables. Areas like factory automation, processes automation, manufacturing industries consultants, embedded system and electronic circuit design covers the realm of job for Instrumentation graduate. Exposure to the latest technologies of distributed control systems (DCS), programmable logic controller sand supervisory control and data acquisition and virtual Instrumentation gives an extra edge to Instrumentation students. The interdisciplinary nature of the program gives opportunities in varioussother exciting fields of Biomedical, Nuclear and Aerospace applications also. For self-sustaining Government of India's initiatives like- "**Make in India**", "**Start-up India**", "**Skilled India**", "**Atma Nirbhar Bharat**", Instrumentation graduates are of utmost necessity.*

**COURSE OUTCOME (REGULAR COURSE)**

SEMESTER	PAPER & COURSE	OUTCOMES
Semester I	<b>INS-RC-1016 Basic Circuit theory and Network analysis</b>	It will describe the basic network theorem, explain basics of analog electronics (BJT, FET, MOSFET) and describe Boolean algebra, combinational and sequential logic circuits.
Semester II	<b>INS-RC-2016 Transducers and sensors</b>	Describe general characteristics of a measurement system. It explains The principle and applications of sensors and transducers. Explain different signal conditioning techniques.
Semester III	<b>INS-RC-3016 Electronic Instrumentation</b>	CO1: Describe different techniques of DC and AC measurements. CO2: Explain different Signal Generators and Displays. CO3: Illustrate different techniques of flow, speed and acceleration measurement. CO4: Elaborate different methods of measuring humidity, moisture and pressure. CO5: Perform experiments on different measurements techniques.
Semester IV	<b>INS-RC-4016 Analytical Instrumentation</b>	CO1: Describe different Molecular and Infrared Spectro-analytical Methods. CO2: Elaborate the principles and applications of different atomic spectroscopic methods. CO3: Explain separation methods and column chromatography methods. CO4: Explain gas chromatography method. CO5: Perform experiments on different analytical methods such as spectrophotometry, gas chromatography and HPLC.

**COURSE OUTCOME (DISCIPLINE SPECIFIC ELECTIVE COURSE)**

Semester V	<b>INS-RE-5016 Microprocessors</b>	CO1: Explain the architecture and instruction set of 8085 microprocessor. CO2: Implement assembly language programming for 8085 microprocessor. CO3: Describe the interfacing techniques of peripheral devices.
	<b>INS-RE-5026 Biomedical Instrumentation</b>	CO1: Describe the man-instrumentation system, biomedical instruments and different transducers used in biomedical. CO2: Explain the origin of bio-potential and design criterion of bio-amplifiers. CO3: Illustrate the Principles of bio-electrodes and electrodes and electrolyte interface. CO4: Explain the basics of different imaging techniques used in biomedical. CO5: Perform Experiments to record ECG signals and count pulses.
	<b>INS-RE-5036 Communication Systems</b>	CO1: Describe basic communication system. CO2: Describe and compare the different types of analog modulation techniques. CO3: Describe different types of transmitters and receivers. CO4: Describe the principle and applications of digital modulation techniques.

Semester VI	<b>INS-RE-6016 Embedded System and Robotics</b>	CO1: Explain architecture of 8085, 8086 microprocessor and 8051 microcontroller. CO2: Illustrate the features, applications and design trends of embedded systems. CO3: Describe interfacing of different peripherals with 8051 microcontroller. CO4: Illustrate the applications of embedded systems in robotics and their features.
	<b>INS-RE-6026 Control Systems</b>	CO1: Describe modeling and controlling of physical parameters. CO2: Illustrate block diagram representation of systems. CO3: Explain time domain analysis of different systems. CO4: Explain Frequency domain analysis of different systems. CO5: Perform experiments on applications of control mechanisms.
	<b>INS-RE-6036 Power Electronics</b>	CO1: Describe basics of power devices such as SCR, Diacs, Triacs and application of SCR. CO2: Describe the principles of different motors viz. AC, DC, induction, single and three phase, synchronous, stepper and servomotors and their driving and controlling circuits. CO3: Explain AC and DC generators, comparison, and classification of transformers, efficiency and losses of transformer. CO4: Illustrate design, development and application of regulated power supply, UPS and SMPS. CO5: Perform experiments on design, fabrication and study of I-V characteristics of SCR, DIAC, TRIAC and characteristics and speed control of DC motor.
<b>COURSE OUTCOME (SKILL ENHANCEMENT COURSE)</b>		
Semester IV	<b>INS-SE-4014 Programming in C</b>	CO1: Explain the basics of C programming. CO2: Demonstrate the use of different types of functions in C, and explain the significance of storage classes. CO3: Explain the significance of arrays to store multiple values under the same name. CO4: Demonstrate the use of pointers to access data directly from memory location and their comparison to arguments functions.
Semester V	<b>INS-SE-5014 Testing and Calibration</b>	CO1: Explain the basics of Calibration and Standardization Practices. CO2: Describe different measurement techniques viz. voltage dividers, comparators, bridges, lock in amplifiers and calibration. CO3: Describe different standardization techniques of production plants, comparison between different calibration methods and calibration modelling. CO4: Illustrate sensor testing and calibration techniques, computing of errors and evaluation of uncertainties in measurement
	<b>INS-SE-5024 PLC and SCADA</b>	CO1: Describe briefly PLC and PLC applications. CO2: Illustrate a PLC program for different applications. CO3: Explain different control mechanisms used in industries. CO4: Elaborate different components of SCADA and communications used in industry.
Semester VI	<b>INS-SE-6014 Virtual Instrumentation</b>	CO1: Describe the LabVIEW program Environment. CO2: Describe the features and programming techniques in NI-LabVIEW. CO3: Illustrate data acquisition basics with different communication protocols.
	<b>INS-SE-6024 VLSI Design and Verification</b>	CO1: Explain the basics of metal oxide semiconductor technology. CO2: Explain the basics of VLSI and its various applications. CO3: Illustrate the background and basic concepts of hardware description languages.



**PROGRAMME OUTCOME AND COURSE OUTCOME**  
**DEPARTMENT : MATHEMATICS**

<b>COURSE OUTCOME (HONOURS COURSE)</b>		
<b>SEMESTER</b>	<b>PAPER &amp; COURSE</b>	<b>OUTCOMES</b>
<b>Semester-I</b>	<b>MAT-HC-1016 Calculus</b>	<p>This course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Learn first and second derivative tests for relative extremum and apply the knowledge in problems in different fields like Business, economics and life sciences etc.</li> <li>• Sketch curves in a plane using its mathematical properties in different coordinate systems.</li> <li>• Compute area of surfaces of revolution and the volume of solids by integrating over cross-sectional areas.</li> <li>• Understand the calculus of vector functions and its use to develop the basic principles of planetary motion.</li> </ul>
	<b>MAT-HC-1026 Algebra</b>	<p>This course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Employ De Moivre's theorem in a number of applications to solve numerical problems.</li> <li>• Learn about equivalent classes and cardinality of set.</li> <li>• Use modular arithmetic and basic properties of congruences.</li> <li>• Recognize consistent and inconsistent system of linear equations by the row echelon form of the augmented matrix.</li> <li>• Learn about solution sets of linear systems using matrix method and cramer's rule.</li> </ul>
<b>Semester-II</b>	<b>MAT-HC-2016 Real Analysis</b>	<p>This course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Understand many properties of the real line <math>\mathbb{R}</math>, including completeness and Archimedean properties.</li> <li>• Learn to define sequences in terms of functions from <math>\mathbb{N}</math> to the subset of <math>\mathbb{R}</math>.</li> <li>• Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.</li> <li>• Apply the ratio, root, and alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.</li> </ul>
	<b>MAT-HC-2026 Differential Equations</b>	<p>This course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Learn basic differential equations and mathematical modeling.</li> <li>• Formulate differential equations for various mathematical models</li> <li>• Solve the first order non-linear differential equations and linear differentials equations of higher order using various techniques.</li> <li>• Apply these techniques to solve and analyze various mathematical models.</li> </ul>
<b>Semester-III</b>	<b>MAT-HC-3016 Theory of Real Functions</b>	<p>This course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Have a rigorous understanding of the concept of limit of a function.</li> <li>• Learn about continuity and uniform continuity of functions defined on intervals.</li> <li>• Understand geometrical properties of continuous functions on closed and bounded intervals.</li> <li>• Learn extensively about the concept of differentiability using limits, leading to better understanding for applications.</li> <li>• Know about applications of mean value theorems and Taylor's theorem.</li> </ul>
	<b>MAT-HC-3026 Group Theory-I</b>	<p>The course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Recognize the mathematical objects that are groups, and classify them as abelian, cyclic and permutation groups, etc.</li> </ul>

		<ul style="list-style-type: none"> <li>• Link the fundamental concepts of groups and symmetrical figures.</li> <li>• Analyze the subgroups of cyclic groups and classify subgroups of cyclic groups.</li> <li>• Explain the significance of the notion of cosets, normal subgroups and factor groups.</li> <li>• Learn about Lagrange's theorem and Fermat's Little theorem.</li> <li>• Know about group homomorphisms and group isomorphisms.</li> </ul>
	<b>MAT-HC-3036 Analytical Geometry</b>	<p>This course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Learn conic sections and transform coordinate systems.</li> <li>• Learn polar equation of conic, tangent, normal and properties.</li> <li>• Have a rigorous understanding of the concept of three dimensional coordinates systems.</li> </ul>
<b>Semester-IV</b>	<b>MAT-HC-4016 Multivariate Calculus</b>	<p>This course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Learn the conceptual variations when advancing calculus from one variable to multivariable discussion.</li> <li>• Understand the maximization and minimization of multivariable functions subject to the given constraints.</li> <li>• Learn about inter-relationship amongst the line integral, double and triple integral formulations.</li> <li>• Familiarize with Green's, Stoke's and Gauss divergence theorems.</li> </ul>
	<b>MAT-HC-4026 Numerical Methods</b>	<p>The course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Learn some numerical methods to find the zeros of nonlinear functions of a single variable and solution of a system of linear equations, up to a certain level of precision.</li> <li>• Know about methods to solve system of linear equations, such as False position method, Fixed point iteration method, Newton's method, Secant method and LU decomposition.</li> <li>• Interpolation techniques to compute the values for a tabulated function at points not in the table.</li> <li>• Applications of numerical differentiation and integration to convert differential equations into difference equations for numerical solutions.</li> </ul>
	<b>MAT-HC-4036 Ring Theory</b>	<p>On the completion of this course, the student will be able to:</p> <ul style="list-style-type: none"> <li>• Appreciate the significance of unique factorization in rings and integral domains.</li> <li>• Learn about the fundamental concept of rings, integral domains and fields.</li> <li>• Know about ring homomorphism and isomorphism theorems of rings.</li> <li>• Learn about the polynomial rings over commutative rings, integral domains, Euclidean domains, and UFD.</li> </ul>
<b>Semester V (Honours Core Course)</b>	<b>MAT-HC-5016 Riemann Integration and Metric Space</b>	<p>The course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Learn about some of the classes and properties of Riemann integrable functions, and the application of the Fundamental theorems of integration.</li> <li>• Know about improper integrals including, beta and gamma functions.</li> <li>• Learn various natural and abstract formulations of distance on the set of usual or unusual entities. Become aware one such formulations leading to metric spaces.</li> <li>• Analyze how a theory advances from a particular frame to a general frame.</li> <li>• Appreciate the mathematical understanding over various geometrical concepts, viz. Balls or connected sets etc. in an abstract setting.</li> <li>• Know about Banach fixed point theorem, whose far-reaching consequences have resulted into an independent branch of study in analysis, known as fixed point theory.</li> <li>• Learn about the two important topological properties, namely connectedness and compactness of metric spaces.</li> </ul>
	<b>MAT-HC-5026 Linear Algebra</b>	<p>The course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Learn about the concept of linear independence of vectors over a field, and the</li> </ul>

		<p>dimension of a vector space.</p> <ul style="list-style-type: none"> <li>• Basic concepts of linear transformations, dimension theorem, matrix representation of a linear transformation, and the change of coordinate matrix.</li> <li>• 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.</li> <li>• Compute inner products and determine orthogonality on vector spaces, including Gram-Schmidt orthogonalization to obtain orthonormal basis.</li> <li>• Find the adjoint, normal, unitary and orthogonal operators.</li> </ul>
<b>Semester-V (Discipline Specific Elective Course)</b>	<b>MAT-HE-5216 Linear Programming</b>	<p>This course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Linear about the graphical solution of linear programming problem with two variables.</li> <li>• Learn about the relation between basic feasible solutions and extreme points.</li> <li>• Understand the theory of the Simplex method used to solve linear programming problems.</li> <li>• Learn about two-phase and big-M methods to deal with problems involving artificial variables.</li> <li>• Learn about the relationship between the primal and dual problems.</li> <li>• Solve transportation and assignment problems.</li> <li>• Apply linear programming method to solve two-person zero-sum game problems.</li> </ul>
	<b>MAT-HE-5226 Spherical Trigonometry and Astronomy</b>	<p>This course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Learn about the properties of spherical and polar triangles.</li> <li>• Know about the fundamental formulae of spherical triangles.</li> <li>• Learn about the celestial sphere, circumpolar star, rate of change of zenith distance and azimuth.</li> <li>• Learn about Kepler's law of planetary motion, Cassini's hypothesis, differential equations for fraction.</li> </ul>
	<b>MAT-HE-5236 Programming in C</b>	<p>After the completion of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Understand and apply the programming concepts of C which is important to mathematical investigation and problem solving.</li> <li>• Learn about structured data-types in C and learn about applications in factorization of an integer and understanding Cartesian geometry and Pythagorean triples.</li> <li>• Use of containers and templates in various applications in algebra.</li> <li>• Use mathematical libraries for computational objectives.</li> <li>• Represent the outputs of programs visually in terms of well formatted text and plots.</li> </ul>
<b>Semester VI (Honours Core Course)</b>	<b>MAT-HC-6016 Complex Analysis</b>	<p>This course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Learn about basic knowledge of complex numbers as well as Cauchy-Riemann equations.</li> <li>• Know about analyticity of different functions.</li> <li>• Use of Cauchy integral formula, Taylor series, and Laurent series.</li> </ul>
	<b>MAT-HC-6026 Partial Differential Equations</b>	<p>This course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Learn about the knowledge of partial differential equations.</li> <li>• Know the applications of Cauchy's and Charpit's methods.</li> <li>• Learn about the general solution of PDF.</li> </ul>
	<b>MAT-HC-6316 Boolean Algebra and Automata Theory</b>	<p>This course will enable the students to:</p> <ul style="list-style-type: none"> <li>• Learn about the basic properties of ordered sets, ordered isomorphism, duality principle etc.</li> <li>• Learn about Lattices as ordered sets, the M3 – N5 theorem with applications etc.</li> <li>• Know about Boolean algebra and Switching circuits.</li> </ul>

	<b>MAT-HC-6416 Rigid Dynamics</b>	The course will enable the students to: <ul style="list-style-type: none"> <li>• Know how to find the moments and products of inertia.</li> <li>• Learn about the motion of the centre of inertia.</li> <li>• Learn about the D'Alembert's principle and Lagrang's equations.</li> <li>• Learn about motion of a body in two dimensions.</li> </ul>
<b>COURSE OUTCOME (GENERIC ELECTIVE COURSE)</b>		
<b>Semester-I</b>	<b>MAT-HG-1016 Calculus</b>	This course will enable the students to: <ul style="list-style-type: none"> <li>• Understand continuity and differentiability in terms of limits.</li> <li>• Describe asymptotic behavior in terms of limits involving infinity.</li> <li>• Use derivatives to explore the behavior of a given function, locating and classifying its extrema, and graphing the function.</li> <li>• Understand the importance of mean value theorems.</li> </ul>
<b>Semester-II</b>	<b>MAT-RC-2016 Algebra</b>	This course will enable the students to: <ul style="list-style-type: none"> <li>• Learn how to solve the cubic and biquadratic equations, also learn about symmetric functions of the roots for cubic and biquadratic.</li> <li>• Employ De Moivre's theorem in a number of applications to solve numerical problems.</li> <li>• Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix. Finding inverse of a matrix with the help of Cayley-Hamilton theorem.</li> <li>• Recognize the mathematical objects that are groups, and classify them as abelian, cyclic and permutation groups, ring etc.</li> <li>• Learn about the concept of linear independence of vectors over a field, and the dimension of a vector space.</li> </ul>
<b>Semester-III</b>	<b>MAT-RC-3016 Differential Equations</b>	The course will enable the students to: <ul style="list-style-type: none"> <li>• Learn basics of differential equations and mathematical modeling.</li> <li>• Solve first order non-linear differential equations and linear differential equations of higher order using various techniques.</li> </ul>
<b>Semester-IV</b>	<b>MAT-RC-4016 Real Analysis</b>	The course will enable the students to: <ul style="list-style-type: none"> <li>• Know the applications of real numbers.</li> <li>• Learn about convergency of sequences.</li> <li>• Know about comparison test, Cauchy's root test, D'Alembert's ratio test, Raabe's test, Leibnitz test etc.</li> </ul>
<b>COURSE OUTCOME (SKILL ENHANCEMENT COURSE)</b>		
<b>Semester-III</b>	<b>MAT-SE-3114 Computer Algebra Systems and Related Software</b>	This course will enable the students to: <ul style="list-style-type: none"> <li>• Use of softwares : Mathematica/MATLAB/Maxima/Maple etc. as a calculator, for plotting functions and animations.</li> <li>• Use of CAS for various applications of matrices such as solving system of equations and finding eigenvalues and eigenvectors.</li> <li>• Understand the use of the statistical software R as calculator and learn to read and get data into R.</li> <li>• Learn use of R in summary calculation, pictorial representation of data and exploring relationship between data.</li> <li>• Analyze, tests, and interpret technical arguments on the basis of geometry.</li> </ul>
<b>Semester-IV</b>	<b>MAT-SE-4224 LaTeX and HTML</b>	The course will enable the students to: <ul style="list-style-type: none"> <li>• Learn about LaTeX and HTML.</li> <li>• Know about graphics in LaTeX.</li> <li>• Know how to make a presentation in Beamer.</li> </ul>



**PROGRAMME OUTCOME AND COURSE OUTCOME**  
**DEPARTMENT : : PHYSICS**

**PROGRAMME OUTCOME**

*The main objective of this programme is to enable the students to understand the basic facts and concept of physics. The students will develop a hand to hand laboratory as well as computational skills along with the theoretical part of physics.*

**COURSE OUTCOME (HONOURS COURSE)**

<b>SEMESTER</b>	<b>PAPER &amp; COURSE</b>	<b>OUTCOMES</b>
<b>Semester I</b>	<b>PHY-HC-1016 Mathematical Physics- I</b>	On successful completion of this course, students will be able to understand vector and its applications in various fields, differential equations and its applications, different coordinate systems, concept of probability and error.
	<b>PHY-HC-1016 Mathematical Physics-I (Laboratory Skills)</b>	Students will have a basic idea about the computational method in solving physical problems. Students will learn interpolation techniques, numerical integrations and to solve first order differential equations.
	<b>PHY-HC-1026 Mechanics</b>	On successful completion of the course students should be able to understand Inertial and non-inertial reference frames, Newtonian motion, Galilean transformations, projectile motion, work and energy, Elastic and inelastic collisions, motion under central force, simple harmonic oscillations, and special theory of relativity.
	<b>PHY-HC-1026 Mechanics (Laboratory Skills)</b>	In this paper students will learn different measuring techniques by Vernier Callipers, Spherometer, Screw gauge, travelling microscope. Students will implement different approaches to measure spring constant, acceleration due to gravity, modulus of rigidity, moment of inertia.
<b>Semester II</b>	<b>PHY-HC-2016 Electricity &amp; Magnetism</b>	After successful completion of this course, students will be able to understand electric and magnetic fields in matter, Dielectric properties of matter, magnetic properties of matter, electromagnetic induction, applications of Kirchhoff's law in different circuits, applications of network theorem in circuits.
	<b>PHY-HC-2016 Electricity &amp; Magnetism (Laboratory Skills)</b>	In this paper students will be able to use multi-meter to measure different parameters of electrical components. Students will also learn to use Potentiometer, Carey Foster's Bridge, De' Sauty's Bridge, Anderson's bridge, Ballistic Galvanometer, measurement of self & mutual inductance, response curve of LCR circuit.
	<b>PHY-HC-2026 Waves and Optics</b>	After successful completion of this course, students will be able to understand superposition of harmonic oscillations, different types of wave motions, superposition of harmonic waves, interference and interferometer, diffraction, holography.
	<b>PHY-HC-2026 Waves and Optics (Laboratory Skills)</b>	In this paper, students will learn to measure the frequency of tuning fork, refractive index, dispersive power & Cauchy constant of the material of a prism, determination of the wavelength of sodium light by Fresnel Bi-prism and Newton's ring method. Students will learn the use of diffraction grating to measure the wavelength, dispersive power & the resolving power.
<b>Semester III</b>	<b>PHY-HC-3016 Mathematical Physics-II</b>	After successful completion of the course, students will be able to solve differential equation using power series solution method, solve differential equation using separation of variable method, special integrals, different properties of matrix, Fourier series.
	<b>PHY-HC-3016 Mathematical Physics-II (Laboratory Skills)</b>	In this paper students will learn the numerical computation by using softwares like MATLAB. After successful completion of this course, students will be able to perform least square fit, curve fitting, solution of linear equations by different methods, Generation of special functions, solution of first and second order differential equations, and solution of partial differential equations.
	<b>PHY-HC-3026 Thermal Physics</b>	Upon successful completion, students will have the knowledge and skills to identify and describe the statistical nature of concepts and laws in

		thermodynamics, in particular: entropy, temperature, thermodynamics potentials, free energies, Maxwell's relations in thermodynamics, behavior of real gases.
	<b>PHY-HC-3026 Thermal Physics (Laboratory Skills)</b>	In this paper students will learn to determine the mechanical equivalence of heat, co-efficient of thermal conductivity of Cu by Searle's and Angstrom's methods & thermal conductivity of a bad conductor by Lee-Charlton's disc method. Students will be able to determine the temperature coefficient & the variations of thermo emf of a thermo couple.
	<b>PHY-HC-3036 Digital Systems &amp; Applications</b>	After successful completions of the course students will be able to understand the working principle of CRO, develop a digital logic and apply it to solve real life problems, Analyze, design and implement combinational logic circuits, Classify different semiconductor memories, Analyze, design and implement sequential logic circuits, Analyze digital system design using PLD, Simulate and implement combinational and sequential circuits.
	<b>PHY-HC-3036 Digital Systems &amp; Applications (Laboratory Skills)</b>	In this paper students will learn to use the CRO and multi-meter, design switch using a transistor, design AND, OR, NOT & XOR gates using NAND gate, design a combinational logic system, half and full adder, half and full subtractor, construction of flip flop circuits using NAND gates.
<b>Semester IV</b>	<b>PHY-HC-4016 Mathematical Physics-III</b>	On successful completion of the course students will be able to solve complex integrals using residue theorem, apply Fourier and Laplace transforms in solving differential equations, understand properties of Tensor like transformation of coordinates, contra-variant and co-variant tensors, indices rules for combining tensors.
	<b>PHY-HC-4016 Mathematical Physics-III Laboratory Skills</b>	In this course, students will get familiar with numerical solutions of first and second order differential equations, methods of numerical integrations, evaluation of Fourier series coefficients etc.
	<b>PHY-HC-4026 Elements of Modern Physics</b>	On completion of the course students will be able to understand modern development in Physics, Starting from Plank's law, it development of the idea of probability interpretation and the formulation of Schrodinger equation. Students will also get preliminary idea of structure of nucleus, radioactivity, Fission and Fusion and Laser.
	<b>PHY-HC-4026 Elements of Modern Physics (Laboratory Skills)</b>	After successful completion of this course, students will be able to understand the experimental approach to find Planks constant, photo-electric effect, determination of work function etc.
	<b>PHY-HC-4036 Analog Systems &amp; Applications</b>	On successful completion of the course students will be able to understand about the physics of semiconductor, p-n junction and devices such as rectifier diodes, Zener diode, photodiode etc. and 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 optional amplifiers and their applications.
	<b>PHY-HC-4036 Analog Systems &amp; Applications (Laboratory Skills)</b>	In this course, students will learn some basic electronics lab skills such as study of the I-V characteristics of PN junction, Zener diode, solar cells etc.
<b>Semester V</b>	<b>PHY-HC-5016 Quantum Mechanics &amp; Applications</b>	On successful completion of the course students will be able to understand the principles in quantum mechanics, such as the Schrodinger equation, the wave function, the uncertainty principle, stationary and non-stationary states, time evolution of solutions, as well as the relation between quantum mechanics and linear algebra. Students will be able to solve the Schrodinger equation for hydrogen atom. Students will have the concepts of angular momentum and spin, as well as the rules for quantization and addition of these, spin orbit coupling and Zeeman effect.
	<b>PHY-HC-5016</b>	After successful completion of this course, students will be able to solve



	<b>Quantum Mechanics &amp; Applications (Laboratory Skills)</b>	numerically some problems of Schrodinger's equations.
	<b>PHY-HC-5026 Solid State Physics</b>	On successful completion of the course students should be able to explain the main features of crystal lattice and phonons, understand the elementary lattice dynamics and its influence on the properties of materials, describe the main features of the physics of electrons in solids, explain the dielectric, ferroelectric and magnetic properties of solids and understand the basic concept in superconductivity.
	<b>PHY-HC-5026 Solid State Physics (Laboratory Skills)</b>	In this course, students will understand how to determine the magnetic susceptibility, coupling coefficients, dielectric coefficients, refractive index of dielectric materials etc.
<b>Semester VI</b>	<b>PHY-HC-6016 Electromagnetic theory</b>	On 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.
	<b>PHY-HC-6016 Electromagnetic theory (Laboratory Skills)</b>	In this paper students will learn some basic experiments about polarization of electromagnetic waves, reflection & refraction of micro waves, finding Stephen's constant, refractive index etc.
	<b>PHY-HC-6026 Statistical Mechanics</b>	On successful completion of the course, students will learn the techniques of statistical mechanics to apply in various fields including Astrophysics, Semiconductors, Plasma Physics, Bio-Physics, Chemistry and in many other directions.
	<b>PHY-HC-6026 Statistical Mechanics (Laboratory Skills)</b>	In this paper, students will learn some computational skills to plot Maxwell-Boltzmann, Fermi-Dirac, Bose-Einstein distributions, comparison of Planck's radiation law with Raleigh-Jean law, comparative studies of different laws on specific heat etc.



**PROGRAMME OUTCOME AND COURSE OUTCOME  
B.COM (HONOURS)**

**PROGRAMME OUTCOME**

*After completing three years for Bachelors in Commerce (B.Com) program, students would gain a thorough grounding in the fundamentals of Commerce and Finance. The commerce and finance focused curriculum offers a number of specializations and practical exposures which would equip the students to face the contemporary challenges in commerce and business activities and to react promptly when confronted with critical decision making. The all-inclusive outlook of the course offers a number of value based and job oriented courses which ensures that students are trained into up to date and that will also ensure them to sustained in the organization level.*

**PROGRAMME SPECIFIC OUTCOME**

*Commerce graduate students will demonstrate progressive affective domain development of values, the role of accounting in society and business. Also they will learn relevant financial accounting career skills, managerial accounting career and will be able to recognize features and roles of businessmen, entrepreneur, managers, consultant etc. Learners will have choices to pursue professional courses such as M.Com, MBA, CMA and also be able to prove their proficiency in various competitive exams like CA, CS, ICWA and other relevant courses.*

**COURSE OUTCOME**

**Semester I**

**COM-AE-1014: Business Communication**

The main aim of this paper is to equip students effectively to acquire skills in reading, writing, comprehension and communication, as also to use electronic media for business communication.

**COM-HC-1026: Financial Accounting**

This paper helps students to acquire conceptual knowledge of the financial accounting and to impart skills for recording various kinds of business transactions.

**COM-HC-1036: Business Law**

The objective of this paper is to impart students the basic knowledge of the important business legislation along with relevant case law. And to provide them with practical legal knowledge of general business law issues. The subject aims at providing a rich fund of contemporary knowledge, time tested principles, basic concepts, emerging ideas, evolving theories, latest technique, ever changing procedures and practices in the field of law.

**COM-GE-1046(A): Micro Economics**

This paper has both theoretical as well as practical importance. It gives information about the production, consumer behavior, different types of market, distribution, economic efficiency etc. to the students.

**COM-GE-1046(B): Investing in Stock Markets**

This paper intends to provide basic skills to the students to operate in stock markets and the ways of investing in it. It will enable the students to take up investment in stock markets independently.

**Semester II**

**ENV-AE-2014: Environmental Studies**

This paper aims at developing a world population among the students that is aware of and concerned about the environment and its associated problems and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively towards solution of current environmental problems and prevention of the new one.

**COM-HC-2016: Corporate Accounting**

This paper helps students to acquire the conceptual knowledge of the corporate accounting and to learn the techniques of preparing the financial statements.

**COM-HC-2036: Corporate Laws**

This paper helps students to impart basic knowledge of the provisions of the Companies Act 2013 and the Depositories Act, 1996. Case studies involving issues in corporate laws are discussed in this subject.

**COM-GE-2046(A): Macro Economics**

After studying this paper students will be able to explain and understand the concepts of macroeconomics. They can associate the current economic phenomenon with existing theory and put their views on contemporary economic issues.

**COM-GE-2046(B): Insurance and Risk Management**

This paper is designed in such a way that students will be able to identify and categorize the various risks faced by an organization. Students will understand the principles of insurance and its usefulness along with its regulatory framework.

### Semester III

**COM-HC-3016: Computer Applications in Business**

This paper aims to provide computer skills and knowledge for commerce students and to enhance the student understands the usefulness of information technology tools for business operations.

**COM-HC-3026: Income Tax Laws and Practice**

This paper helps student by providing basic knowledge and equip students with applications of principles and provisions of Income Tax Act, 1961 and the relevant rules.

**COM-HC-3036: Management Principles and Applications**

The benefit of studying this paper is that it offers students the opportunity to undertake work placements and professional projects. This, in turn, equips them with practical exposure as well as technical knowledge and transferable, soft skills. The basic objective of this subject is to provide the student with an understanding of basic management concepts, principles and practices.

**COM-GE-3046(A): Business Statistics**

The objectives of this paper are to familiarize the students with basic statistical tools used for managerial decision making.

**COM-GE-3046(B): Operation Research in Business**

This paper helps the students to understand mathematical models used in operations research- Linear programming problems, usage of techniques in business decisions and various tools of operations research.

**COM-SEC-HC-3054(A): Entrepreneurship**

The purpose of this paper is to orient the learner toward entrepreneurship as a career option and creative thinking and behavior. Entrepreneurship teaches students crucial life skills, such as: how to collaborate and work with a team, how to speak in public, how to collect and analyze data, how to use curiosity and creativity to find an innovative approach to difficult problems, etc. It helps the students learn and understand the product development cycle and come up with their own unique business proposals.

**COM-SEC-HC-3054(B): New Venture Planning**

This subject aims at giving exposure to students regarding different aspects of setting up a new business. After completing the course student should be able to develop an understanding of the process of identifying various sources of new business ideas of products and services. The understanding of this paper will help them to examine, evaluate, and approach different sources of finance, the nature of marketing effort required and to develop a comprehensive business plan.

### SEMESTER IV

**COM-HC-4016: Cost Accounting**

This paper helps the students to learn the basic concepts used in cost accounting, various methods involved in cost ascertainment and cost accounting book keeping systems.

**COM-HC-4026: Business Mathematics**

The aim of this paper is to familiarize the students with the basic financial mathematics tools, with an emphasis on applications to business and economic situations.

**COM-HC-4036: Human Resource Management**

The objective of this subject is to acquaint students with the techniques and principles to manage human resource of an organization. The skills, talents and knowledge students pick up while studying HR are of universal relevance across all business types and sectors. Students pursuing a program in human resource management are likely to become potential hiring managers after they have completed their course. This subject helps student learn more about the development of a strategic technique to recruit, train, and develop the workers which are essential asset for an organization.

**COM-GE-4046(A): Indian Economy**

On completion of this paper students will be able to develop ideas of the basic characteristics of Indian Economy. This paper aware the students about the various problems of Indian Economy.

**COM-GE-4046(B): Micro Finance**

This paper aims to make the students understand the basic concepts of micro-finance and its importance, institution structure, management of micro finance institutions and microfinance in Indian context.

**COM-SEC-HC-4054(A): E Commerce**

The paper helps to enable the students to become familiar with the mechanism for conducting business transactions through electronic means.

**COM-SEC-HC-4054(B): E-Filing of Returns**

This paper provides the students the basic concepts and practical knowledge about electronic filling of returns.

## SEMESTER V

### **COM-HC-5016: Principles of Marketing**

This subject helps students in understanding the concepts, principles, tools and techniques of marketing. A marketing student studies the branding and promotion of products and services to the public, which is targeted through specific demographics. Marketing touches many areas of study, so students will be well versed in advertising, communications, consumer behavior, public relations, and marketing strategy and research.

### **COM-HC-5026: Fundamentals of Financial Management**

This subject familiarizes the students with the principles and practices of financial management. This paper creates awareness about capital structure and theories of capital structure, cost of capital in wide aspects, dividend policies and various dividend models, working capital management.

### **COM-DSE-HC-5036 (A): Management Accounting**

This paper imparts the student, knowledge about the use of financial, cost and other data for the purpose of managerial planning, control and decision making.

### **COM-DSE-HC-5036 (B): Advanced Financial Accounting**

This paper imparts advanced knowledge on financial accounting applicable in business of special nature and on Government accounting system.

### **COM-DSE-HC-5036(C): Advertising**

This paper helps familiarize the students with the basic concepts, tools and techniques of advertising used in marketing.

Advertising is the art and business of enticing consumers to purchase a product or service. There are many reasons to study advertising, including the skills one acquires, the diversity of employment opportunities and the various concentrations available. Students studying this subject acquire a variety of skills that they can use in many career settings, which include:

- Campaign planning and development
- Persuasion and motivation
- Critical thinking
- Researching
- Evaluating campaign success

### **COM-DSE-HC-5036(D): Banking**

This paper make the students understand the various services offered and various risks faced by banks, various principles, provisions that govern the Life Insurance Contracts and aims to make the students aware of various banking facilities and innovations after nationalization.

### **COM-DSE-HC-5036 (E): Computerized Accounting System**

This paper aims at enhancing the skills needed for computerized accounting system and to enable the students to develop simple accounting applications.

### **COM-DSE-HC-5036(F): Indian Financial System**

This paper provides students the basic knowledge of Indian Financial System and its components, institutions, and their functions.

## Semester VI

### **COM-HC-6016: Auditing and Corporate Governance**

This paper provides knowledge of auditing principles, procedures and techniques in accordance with current legal requirements and professional standard and to give an overview of the principles of Corporate Governance and Corporate Social Responsibility.

### **COM-HC-6026: Indirect Tax Laws**

This paper provides basic knowledge and equips students with application of principles and provisions of Service Tax, VAT, Central Excise and Custom Laws.

### **COM-DSE-HC-6036(A): Fundamentals of Investment**

This subject aims to familiarize the students with different investment alternatives, introduce them to the framework of their analysis and valuation and highlight the role of investor protection.

### **COM-DSE-HC-6036(B): Consumer Affairs and Customer Care**

This paper seeks to familiarize the students with their rights as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights. It also provides an understanding of the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards. The student should be able to comprehend the business firms' interface with consumers and the consumer related regulatory and business environment.

**COM-DSE-HC-6036 (C): Advanced Corporate Accounting**

This paper aims to help the students to acquire advanced knowledge of corporate accounting and to learn the techniques of preparing accounts and statements under various corporate situations.

**COM-DSE-HC-6036(D): International Business**

The objective of the course is to familiarize the students with the concepts, importance and dynamics of international business and India's involvement with global business. The course also seeks to provide theoretical foundations of international business to the extent these are relevant to the global business operations and developments. This paper helps students in understanding the global challenges companies face, looking at international boundaries, trade, global economies and how to negotiate with diverse cultures.

**COM-DSE-HC-6036(E): Industrial Relations and Labour Laws**

This paper helps the students to learn the concepts of industrial relations including trade unions, collective bargaining, discipline and various labour enactments.

**COM-DSE-HC-6036(F): Business Research Methods and Project Work**

This course aims to at providing the general understanding of business research and the methods of business research. The course will impart learning about how to collect, analyze, present and interpret data.

This paper includes two sections A and B. There shall be written examination on section A of 50% marks on the basics of Business Research methods, process, measurement and Hypothesis Testing and in section B the students will write a project report based on field work which will carry the other 50% marks of the particular paper.



**PROGRAMME OUTCOME AND COURSE OUTCOME  
DEPARTMENT : : ZOOLOGY**

**PROGRAMME OUTCOME**

*Apart from engaging themselves in study, research and documenting the fascinating fauna of nature, there are also many other specializations that the students pursuing the field can venture into. Being physiologists, taxonomists, embryologist, ecologist, academicians, biotechnologist, microbiologist, etc. are some of the few among them since the program imparts intellectual and professional skill.*

**PROGRAMME SPECIFIC OUTCOME**

*Helps them to know about the diverse animal diversity, its ecological and evolutionary relationship among each other.*

*They will know about the various technique of studying animal diversity, or other aspects of animal study such as their behaviour, physiology etc. By gaining knowledge about the biology of animals students can help contribute indifferent problems of nature in day to day life such as man animal conflict etc. Students may also undertake entrepreneurship projects on fisheries, sericulture, animal husbandry, agriculture improvement and contribute to economic growth of the country.*

*Regular project work, seminars and field study help them to learn how to present themselves or critically analyse situation and report them scientifically. Core issues of wildlife management, ecological disruptions, environmental pollution, disease effecting poultry, agriculture, etc. could be well solved with this knowledge of Zoology.*

**COURSE OUTCOME (HONOURS COURSE)**

<b>SEMESTER</b>	<b>PAPER &amp; COURSE</b>	<b>OUTCOMES</b>
<b>Semester I</b>	<b>Core Course I ZOO-HC-1016</b>	<p><b>Non-Chordates I: Protists to Pseudocoelomates:</b> Gather knowledge about animal kingdom and on different groups of invertebrate animals are studied like Protozoa, Porifera, Cnideria, Plathyhelminthes, Nemahelminthes. General characters and classification upto order are studied. Some special features, organs, pathogenecity, life history and significance are studied here.</p> <p><b>Practical:</b> Students gather practical knowledge about different invertebrates by studying prepared slides and life stages of helminthes and their pathogenicity. They also examine and get fist hand knowledge about the protists in pond water.</p>
	<b>Core Course II ZOO-HC-1026</b>	<p><b>Principles of Ecology:</b> In this unit they become aware about their surrounding i.e. ecology and ecosystems, different biogeochemical cycles. The students gather knowledge about Population- its interaction , principle, characters, attributes; Community – its characters, theories,. Ecological succession; Ecosystem- types, food chains and Energy Flow. From this unit the students learn about application of ecology, especially in wildlife, Wildlife, its principle, conservation and management, about national parks and wildlife sanctuaries and different endangered species and their conservation. They are introduces the concept of conservation measure.</p> <p><b>Practical:</b> The student gathers knowledge about the life table, survivorship curves Shanon-Weiner index. They also study the plankton and pond ecosystem. And they have first-hand knowledge about national parks and wildlife sanctuaries and different endangered species and their conservation by visiting National Park / Biodiversity Park /Wildlife sanctuary.</p>
<b>Semester II</b>	<b>Core Course III ZOO-HC-2016</b>	<p><b>Non chordates II: Coelomates:</b> The students get to know about the amazing diversity of non-chordates from simple to complex ones. It enlightens them with the knowledge of how each phylum of non-chordates arose and how did they establish themselves in the environment with their special characteristics. Here, the students also get to deal with the similarities and dissimilarities among these phyla and their classification up to order.</p> <p><b>Practical:</b> Students develop a practical understanding of non-chordates by studying live specimens of annelids, molluscs and echinoderms. They understand a comparative account of various organ systems in earthworm and cockroach.</p>

	<b>Core Course IV ZOO-HC-2026</b>	<p><b>Cell Biology:</b> The students get to know about the cells which are the unit of life. In this particular paper they know about cell membranes, cell organelles, nucleus and arrangement of cell. The student will also know about how cell divides and how they signal each other to pass the messages or to perform the required actions on the body.</p> <p><b>Practical:</b> In this particular paper the student will know the process of staining, preparation of permanent slides and biochemical tests. They will study the cell division stages and will get to know about the cells.</p>
Semester III	<b>Core Course V ZOO-HC-3016</b>	<p><b>Diversity of Chordata:</b> The students are able to get a detailed and clear picture of the different taxa of chordates. They acquire knowledge about retrogressive metamorphosis in Urochordates, origin of chordates from echinoderms, parental care in fish and Reptilia and an overview of adaptive radiation in chordates. From zoogeography, the students get a basic understanding regarding evolutionary history of earth and the factors/modes of speciation.</p> <p><b>Practical:</b> Students develop a better understanding of various phyla of chordates with the help of live specimen. They also get practical knowledge regarding fish physiology by mounting Weberian ossicle.</p>
	<b>Core Course VI ZOO-HC-3026</b>	<p><b>Animal Physiology: Controlling and Coordinating Systems:</b> In this particular paper the student could gain knowledge about physiology of animal by studying about connective tissues, the various system of animal body and about their hormonal and physiological functions. The topics included in this particular paper will help the student to clear their concept for the topics related to NET/SLET and other competitive exams.</p> <p><b>Practical:</b> The practical included here will give the student knowledge about various cells, fibres, endocrine glands and the structures with the help of histological process</p>
	<b>Core Course VII ZOO-HC-3036</b>	<p><b>Fundamentals of Biochemistry:</b> The paper will help the student to know about the chemicals, their properties, structure, synthesis associated with animal body. They will know how the human body works with the help of chemicals and enzymes and how it regulates or balances itself.</p> <p><b>Practical:</b> The entire practical here are biochemistry based which will enlighten the student about the estimation of various molecules, use of chromatography technique, electrophoresis and the activity of salivary amylase depending on various factor.</p>
	<b>SEC: ZOO-SE-3014</b>	<p><b>Ornamental Fish and Fisheries:</b> To make the students aware of the vast potentials involved in ornamental fish diversity of North East India, farming and trading besides making them learn the diseases in fishes and other constraints in their culturing.</p> <p>After completing this course the learners will be able to-</p> <ul style="list-style-type: none"> <li>•Learn the scientific method of setting an aquarium</li> <li>•Learn the culture breeding and marketing techniques of common indigenous ornamental fishes.</li> </ul>
Semester IV	<b>CORE COURSE VIII ZOO-HC-4016</b>	<p><b>Comparative Anatomy of Vertebrates:</b> The course will help the student to know about the physiological systems of animal body. The paper includes integumentary, skeletal, digestive, respiratory, circulatory, urogenital, and nervous and sense organs of organisms. It also contains the working mechanisms and structure of the physiological systems.</p> <p><b>Practical:</b> The practical in this particular paper will give an overview of the skeleton system of various groups of animals. It will provide with knowledge of different scales, skulls including structures of various organs (heart, lungs, etc.).</p>
	<b>CORE COURSE IX ZOO-HC-4026</b>	<p><b>Animal Physiology: Life Sustaining Systems:</b> The paper will be useful for learning physiology and regulatory processes of the organs important for digestion, respiration, excretion and cardiac cycle. It includes study of glands, blood grouping, balancing of enzymes, ions and various biological factors in a human body. This will help them to prepare for competitive exams as well.</p>

		<b>Practical:</b> The practical include counting and detection of blood constituents like RBC, WBC, and haemoglobin and haemin crystal. This will help the student to know about the required blood factors and how to check it.
	<b>CORE COURSE X ZOO-HC-4036</b>	<b>Biochemistry of Metabolic Processes:</b> The paper includes the energy making and flow of energy in animal body via studying about ATP, the electron chain system or mitochondrial system. This will help them to know about the energy sources, utilization of it and production of it. <b>Practical:</b> The student will know to estimate protein, use of laboratory instruments (colorimeter, tissue homogenizer), detection of protein, activities of enzymes. This will let the student to work in laboratories and do research in future.
	<b>SEC 2 : ZOO-SE-4014</b>	<b>Non-Mulberry Sericulture:</b> Students will be able to understand overall aspects of Sericulture, viz., and non-mulberry silkworms and their food plants, Rearing and rearing operation of the silkworm, Silkworm pathology, Process of silkworm seed production and silk technology. This course creates awareness among students about the economic importance and suitability of Sericulture in Indian conditions. Students will learn various technologies involved in Sericulture.
<b>Semester V</b>	<b>CORE COURSE XI ZOO-HC-5016</b>	<b>Molecular Biology:</b> The paper will benefit the student in understanding the various mechanisms related to DNA and RNA and about gene regulatory processes of animal body. It includes the basic concept about translation, transcription, nucleic acid, replication, repairing, etc. It will also help them for their higher studies. <b>Practical:</b> The practical include about culture methods, use of colorimeter and dissection procedure. It will help them to know about estimation of RNA, DNA and photographic study of DNA replication, transcription and about split genes.
	<b>CORE COURSE XII ZOO-HC-5026</b>	<b>Principles of Genetics:</b> The paper will enhance the knowledge about determination of sex and differentiation. It includes about Mendelian genetics, inheritance, recombination, mutation and about the formation of genes/ characters in development of organisms. It will provide the student the insight of cell and how genetic traits are transformed from parent generation to next generation which is the basis of diversity in animal world. <b>Practical:</b> The practical here includes about karyotype study of human, study of linkage maps, chi-square analysis and pedigree analysis. These entire practical help them to study about the genes and traits responsible for the diseases and their origin. This will also help them in field research.
	<b>ZOO-HE-5016</b>	<b>Computational Biology And Biostatistics:</b> This course gives the students a clear idea about the application of bioinformatics and statistics in biology. Bioinformatics gives them an insight regarding some key concepts such as genomics, knowledge of various databases of proteins, nucleic acids and generation of data and data retrieval of these biomolecules. The students are also provided with the basic concepts of statistics such as measures of central tendency up to performing Chi-square test and t-test. <b>Practical:</b> Students become familiar with widely used bioinformatics databases such as BLAST. They perform one-sample t-test. Eventually they can interpret these computational and statistical analyses with real molecular biology data.
	<b>ZOO-HE-5036</b>	<b>Endocrinology:</b> The course will benefit by giving an idea on endocrine system of organisms, the action and regulation of hormones and their functions. This will help them to study the organs histologically and will make them aware of the glands and their importance. <b>Practical:</b> The practical consists dissection of endocrine gland it will help the student to learn the arrangement of endocrine gland in organisms. They will learn about ovariectomy and also primer designing which is important for laboratory works.
<b>Semester VI</b>	<b>Core Course XIII ZOO-HC-6016</b>	<b>Developmental Biology:</b> The paper will help the student to understand the embryonic development at different levels and time. It includes about the



		<p>biochemical events like cell-cell interaction, pattern formation, cell growth, differentiation, etc. It will make them aware of the processes their regulation, control and about the factors which impacts the normal development of a cell. The course will help the student to prepare for competitive exams also.</p> <p><b>Practical:</b> The practical here includes study of chick embryo development in hours which will enhance their knowledge on embryo development. The paper is beneficial for the student willing to do research as it will allow them to learn drosophila culture and also let them to know the various stages related to development.</p>
	<b>Core Course XIV ZOO-HC-6026</b>	<p><b>Evolutionary Biology:</b> The paper gives ideas of origin of species on earth. The paper explains how evolutionary factors affected species deviation from each other as described by various scientists like Lamarck, Darwin etc. The knowledge from the paper will definitely help students to qualify in the exams like NET/SLET.</p> <p><b>Practical:</b> The practical are beneficial for the students those who are interested in evolutionary biology study. The practical help students how to construct phylogenetic trees with the help of bioinformatics tool. Besides students will get to study fossils, homology and analogy from suitable specimen.</p>
	<b>CODE: ZOO-HE-6026</b>	<p><b>Fish And Fisheries:</b> Fish and fisheries give knowledge about the wide scope in fish rearing, cultivation and marketing. The students will learn about the physiology of fishes ,culture of fishes ,fishing gears and crafts, diseases of fishes, fishery by-products etc. The paper also includes study about fishes used in research.</p> <p><b>Practical:</b> The practical knowledge will help the students to learn more about the fishes. Included practical like morphometric and meristic character study helps in identification of fish's .Study of water quality parameters, fish scales; air breathing organs in different fishes, fishing gears and crafts also helps them to have more knowledge on fish and fisheries.</p>
	<b>CODE: ZOO-HE-6056</b>	<p><b>Dissertation:</b> Dissertation helps a student to test their independent research skills. It gives them an opportunity to delve deeper into an area of their interest. By completing a dissertation in degree level a student gains knowledge and confidence which helps him/her to do further research in his/her future career. Text book topics or classroom discussions have a limited scope to explore the hidden talent of a student, whereas dissertation gives the freedom to express it.</p>
<b>COURSE OUTCOME (REGULAR COURSE)</b>		
<b>Semester I</b>	<b>ZOO-RC-1016</b>	<p><b>Animal Diversity:</b> The paper will be very useful to students in the sense that it deals with Animal Diversity which is the basis of Zoology or Biology as a whole. In the paper they will gain knowledge about the Non-Chordates and Chordates and classification up to orders of each phylum as a whole. They will learn about the different aspects of the animals of each phylum like life histories and different systems etc.</p> <p><b>Practical:</b> This paper gives the students a practical knowledge of animal kingdom. They can learn the characters and chordates through museum specimens to know them better. They will also learn about the internal structure through the section of organisms with the help of permanent slides. They will also be able to differentiate between poisonous and non-poisonous snakes.</p>
<b>Semester II</b>	<b>ZOO-RC-2016</b>	<p><b>Comparative Anatomy And Developmental Biology Of Vertebrates:</b> Students gets a better understanding regarding structures of different systems such as integumentary, skeletal, digestive, respiratory, circulatory, urinogenital, nervous and sensory organs in comparative way among the vertebrate groups. This paper also introduces students to the concept of gamete formation and how a single-celled fertilized egg becomes an embryo and then a fully formed adult by going through three important processes of cell division, cell differentiation and morphogenesis.</p> <p><b>Practical:</b> Students get a detailed knowledge about embryology through</p>

		permanent slides of frog, different types of placenta and examination of gametes.
Semester III	ZOO-RC-3016	<p><b>Physiology and Biochemistry:</b> The student will come to know about the working and function of nerve and muscle, about digestion, respiration, excretion, cardiovascular system. The processes by which a normal healthy body can regulate itself. Moreover about the endocrine glands, its hormonal regulation, about the reproduction system. It will also help them to know about the chemical constituents of animal body, how they are synthesized and balanced.</p> <p><b>Practical:</b> The practical course will provide the student with the study and preparation of blood constituents and slide examination. It also includes qualitative test which will help the student in their research work later.</p>
	ZOO-SE-3014	<p><b>Ornamental Fish and Fisheries:</b> To make the students aware of the vast potentials involved in ornamental fish diversity of North East India, farming and trading besides making them learn the diseases in fishes and other constraints in their culturing.</p> <p>After completing this course the learners will be able to-</p> <ul style="list-style-type: none"> <li>•Learn the scientific method of setting an aquarium</li> <li>•Learn the culture breeding and marketing techniques of common indigenous ornamental fishes.</li> </ul>
Semester IV	ZOO-RC-4016	<p><b>Genetics And Evolutionary Biology:</b> The paper will be useful for the student as they will know about Mendelian genetics, cell, history of life, determination of sex, about evolution, about the concept of species. They will know the origin of life and how the cells work together. How the animal world is divided into species and how these species has evolved them to survive in the environment.</p> <p><b>Practical:</b> The paper includes the study of human karyotype, phylogeny, fossils, chi-square test. In this paper they will also know about report making and about importance of museum.</p>
	ZOO-SE-4016	<p><b>Apiculture:</b> Students can learn about the biology and the skill of rearing of bees, its diseases, economy and entrepreneurship in apiculture. Apiculture provides products such as honey and wax that are used commercially. Honeybees are responsible for pollination and thus help in increasing the yield of the several plants. Some recent researches have proven that honey bees venom comprises a mixture of proteins that has the capability of destroying the AIDS virus. These aspects can be explored for research and development.</p>
Semester V	DSE 2: ZOO-RE-5026	<p><b>Applied Zoology:</b> This paper is helpful in understanding about the silk producing insects of Assam except the mulberry or pat silkworm. It provides knowledge about the rearing techniques of some non-mulberry silkworms like eri, muga, and tassar .The paper will help some enthusiastic students to develop small scale industries like textile industries.</p> <p><b>Practical:</b> Practically they will learn about the life cycle and different life stages of certain organisms; will study about human disease causing vectors, about insects. In this paper they will learn about report writing which will help them in their future career.</p>
	DSE 4 : ZOO-RE-6026	<p><b>Insect, vectors and diseases:</b> This paper is very useful for students as it deals with insects, vectors and diseases. They will learn about the insects that are vectors of many diseases, host- vector relationship and adaptations acquired by these insects as vector. As insects such as mosquitoes, house fly, sand fly, fleas, human louse and bugs causes diseases like malaria, dengue, viral encephalitis, leishmaniasis, plague, typhus fever, relapsing fever, chagas disease etc. Along with the diseases they will learn about the control measures of these diseases which seriously cause harm to the human and animals.</p>
		<p><b>Practical:</b> Practically they will learn about different types of mouth parts used by the insect vectors like mosquitoes, house fly, sand fly, fleas, human louse and bugs causes diseases like malaria, dengue, viral encephalitis, leishmaniasis, plague, typhus fever, relapsing fever, chagas disease etc.</p>

## COURSE OUTCOME OF TWO YEARS MASTER DEGREE COURSE M.SC IN ZOOLOGY

1. Students will be able to identify the major groups of organisms with an emphasis on animals and be able to classify them within a phylogenetic framework also using bioinformatics tools.
2. Students will be able to compare and contrast the characteristics of animals that differentiate them from other forms of life.
3. Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped animal morphology, physiology, life history, and behaviour.
4. Students will be able to explain how organisms function at the level of the gene, genome, cell, tissue, organ and organ -system. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and behaviour of different forms of life.
5. Students will be able to explicate the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems.
6. Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within biology.
7. Students will be able to demonstrate proficiency aquaculture management practices, induced breeding, insect culture etc.
8. Students will use current biochemical and molecular techniques to plan and carry out experiments. They will generate and test hypotheses, analyse data using statistical methods where appropriate, and appreciate the limitations of conclusions drawn from experimental data.



**PROGRAMME OUTCOME AND COURSE OUTCOME  
DEPARTMENT : CHEMISTRY**

**PROGRAMME OUTCOME**

**COURSE OUTCOME (HONOURS COURSE)**

<b>SEMESTER</b>	<b>PAPER &amp; COURSE</b>	<b>OUTCOMES</b>
<b>Semester I</b>	<b>CHE-HC-1016 INORGANIC CHEMISTRY-I</b>	On successful completion, students would have clear understanding of the concepts related to atomic and molecular structure, chemical bonding, periodic properties and redox behaviour of chemical species. Students will also have hands on experience of standard solution preparation in different concentration units and learn volumetric estimation through acid-base and redox reactions.
	<b>CHE-HC-1026 PHYSICAL CHEMISTRY I</b>	In gaseous state unit the students will learn the kinetic theory of gases, ideal gas and real gases. In liquid state unit, the students are expected to learn the qualitative treatment of the structure of liquid along with the physical properties of liquid, viz. vapour pressure, surface tension and viscosity. In the molecular and crystal symmetry unit they will be introduced to the elementary idea of symmetry which will be useful to understand solid state chemistry and group theory in some higher courses. In solid state unit the students will learn the basic solid state chemistry application of x-ray crystallography for the determination of some very simple crystal structures. The students will also learn another important topic "ionic equilibria" in this course.
	<b>CHE-HG-1016 CHEMISTRY1 ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY &amp; ALIPHATIC HYDROCARBONS</b>	After completion of this course the students will learn the atomic structure through the basic concepts of quantum mechanics. They will understand the chemical bonding through VB and MO approaches. In organic part, the students are expected to learn basic ideas used in organic chemistry, stereochemistry, functional groups, alkanes, alkenes, alkynes etc.
<b>Semester II</b>	<b>CHE-HC-2016 ORGANIC CHEMISTRY I</b>	Students will be able to identify different classes of organic compounds, describe their reactivity and explain/analyze their chemical and stereo chemical aspects.
	<b>CHE-HC-2026 PHYSICAL CHEMISTRY II</b>	In this course the students are expected to learn laws of thermodynamics, thermochemistry, thermodynamic functions, relations between thermodynamic properties, Gibbs Helmholtz equation, Maxwell relations etc. Moreover the students are expected to learn partial molar quantities, chemical equilibrium, solutions and colligative properties. After completion of this course, the students will be able to understand the chemical systems from thermodynamic point of view.
	<b>CHE-HG-2016 CHEMISTRY2 s- AND p-BLOCK ELEMENTS, TRANSITION ELEMENTS, COORDINATION CHEMISTRY STATES OF MATTER &amp; CHEMICAL KINETICS</b>	After completion of this course the students will learn periodic properties in main group elements, transition metals (3d series). They will also learn the crystal field theory in coordination chemistry unit. In physical chemistry part, the students are expected to learn kinetic theory of gases, ideal gas and real gases, surface tension, viscosity, basic solid state chemistry and chemical kinetics.
<b>Semester III</b>	<b>CHE-HC-3016 INORGANIC CHEMISTRY-II</b>	On successful completion of this course students would be able to apply theoretical principles of redox chemistry in the understanding of metallurgical processes. Students will be able to identify the variety of s and

		p block compounds and comprehend their preparation, structure, bonding, properties and uses. Experiments in this course will boost their quantitative estimation skills and introduce the students to preparative methods in inorganic chemistry.
	<b>CHE-HC-3026 ORGANIC CHEMISTRY-II</b>	Students will be able to describe and classify organic compounds in terms of their functional groups and reactivity.
	<b>CHE-HC-3036 PHYSICAL CHEMISTRY-III</b>	The students are expected to learn phase rule and its application in some specific systems. They will also learn rate laws of chemical transformation, experimental methods of rate law determination, steady state approximation etc. in chemical kinetics unit. After attending this course the students will be able to understand different types of surface adsorption processes and basics of catalysis including enzyme catalysis, acid base catalysis and particle size effect on catalysis.
	<b>CHE-HG-3016 CHEMISTRY 3 CHEMICAL ENERGETICS, EQUILIBRIA &amp; FUNCTIONAL ORGANIC CHEMISTRY-I</b>	After completion of this course the students will be able to understand the chemical system from thermodynamic points of view. They will also learn two very important topics in chemistry- chemical equilibrium and ionic equilibrium. In organic chemistry part, the students are expected to learn various classes of organic molecules-alkyl halides, arylhalides, alcohols, phenols, ethers, aldehydes and ketones.
	<b>CHE-SE-3034 BASIC ANALYTICAL CHEMISTRY</b>	Upon completion of this course, students shall be able to explain the basic principles of chemical analysis, design/implement microscale and semimicro experiments, record, interpret and analyze data following scientific methodology.
<b>Semester IV</b>	<b>CHE-HC-4016 INORGANIC CHEMISTRY-III</b>	On successful completion, students will be able to name coordination compounds according to IUPAC, explain bonding in this class of compounds, understand their various properties in terms of CFSE and predict reactivity. Students will be able to appreciate the general trends in the properties of transition elements in the periodic table and identify differences among the rows. Through the experiments students not only will be able to prepare, estimate or separate metal complexes/compounds but also will be able to design experiments independently which they should be able to apply if and when required.
	<b>CHE-HC-4026 ORGANIC CHEMISTRY-III</b>	Students shall demonstrate the ability to identify and classify different types of N-based derivatives, alkaloids and heterocyclic compounds/explain their structure mechanism and reactivity/critically examine their synthesis and reactions mechanism.
	<b>CHE-HC-4036 PHYSICAL CHEMISTRY-IV</b>	In this course the students will learn theories of conductance and electrochemistry. Students will also understand some very important topics such as solubility and solubility products, ionic products of water, conductometric titrations etc. The students are also expected to understand the various parts of electrochemical cells along with Faraday's Laws of electrolysis. The students will also gain basic theoretical idea of electrical & magnetic properties of atoms and molecules.
	<b>CHE- HG-4016 CHEMISTRY4 SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE, ELECTROCHEMISTRY &amp; FUNCTIONAL GROUP ORGANIC CHEMISTRY</b>	After completion of this course the students learn solutions, phase rule and its application in specific cases, basics of conductance and electrochemistry. Students will also learn some important topics of organic and biochemistry- carboxylic acids, amines, amino acids, peptides, proteins and carbohydrates.
	<b>CHE-SE-4014 ANALYTICAL CLINICAL BIOCHEMISTRY</b>	Students will be able to identify various molecules relevant to a particular pathological condition and their estimation protocols.

<b>Semester V (Honours Core Course)</b>	<b>CHE-HC-5016 ORGANIC CHEMISTRY-IV</b>	Students will be able to explain/describe the important features of nucleic acids, amino acids and enzymes and develop their ability to examine their properties and applications.
	<b>CHE-HC-5026 PHYSICAL CHEMISTRY V</b>	After completion of this course the students are expected to understand the application of quantum mechanics in some simple chemical systems such as hydrogen atom or hydrogen like ions. The students will also learn chemical bonding in some simple molecular systems. They will be able to understand the basics of various kinds of spectroscopic techniques and photochemistry.
	<b>CHE-HE-5026 ANALYTICAL METHODS IN CHEMISTRY</b>	On successful completion students will be able to have theoretical understanding about choice of various analytical techniques used for qualitative and quantitative characterization of samples. At the same time through the experiments students will gain hands on experience of the discussed techniques. This will enable students to take judicious decisions while analyzing different samples.
	<b>CHE-HE-5056 POLYMER CHEMISTRY</b>	After completion of this course the students will learn the definition and classifications of polymers, kinetics of polymerization, molecular weight of polymers, glass transition temperature, and polymer solutions etc. They also learn the brief introduction of preparation, structure and properties of some industrially important and technologically promising polymers.
<b>Semester VI (Honours Core Course)</b>	<b>CHE-HC-6016 INORGANIC CHEMISTRY-IV</b>	By studying this course the students will be expected to learn about how ligand substitution and redox reactions take place in coordination complexes. Students will also learn about organometallic compounds, comprehend their bonding, stability, reactivity and uses. They will be familiar with the variety of catalysts based on transition metals and their application in industry.  On successful completion, students in general will be able to appreciate the use of concepts like solubility product, common ion effect, pH etc. in analysis of ions and how a clever design of reactions, it is possible to identify the components in a mixture. With the experiments related to coordination compound synthesis, calculation of $10Dq$ , controlling factors etc. will make the students appreciate the concepts of theory in experiments.
	<b>CHE-HC-6026 ORGANIC CHEMISTRY-V</b>	Students will be able to learn basic principles of different spectroscopic techniques and their importance in chemical/organic analysis. Students shall be able to classify/identify/critically examine carbohydrates, polymers and dye materials.
	<b>CHE-HE-6016 GREEN CHEMISTRY</b>	Apart from introducing learners to the principles of green chemistry, this course will make them conversant with applications of green chemistry to organic synthesis. Students will be prepared for taking up entry level jobs in the chemical industry. They also will have the option of studying further in the area.
	<b>CHE-HE-6026 INDUSTRIAL CHEMICALS AND ENVIRONMENT</b>	After successful completion of the course, students would have learnt about the manufacture, applications and safe ways of storage and handling gaseous and inorganic industrial chemicals. Students will get to know about industrial metallurgy and the energy generation industry. Students will also learn about environmental pollution by various gaseous, liquid wastes and nuclear wastes and their effects on living beings. Finally, the students will learn about industrial waste management, their safe disposal and the importance of environment friendly "green chemistry" in chemical industry.
	<b>CHE-HE-6036 INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE</b>	This course will establish the basic foundation of industrial inorganic chemistry among the students. This will be helpful for pursuing further studies of industrial chemistry in future. Experiments will help the Students to gather the experience of qualitative and quantitative chemical analysis. Students will be capable of doing analysis of the inorganic materials which are used in our daily life. They will have insight of the industrial processes.

	<b>CHE-HE-6046 RESEARCH METHODOLOGY FOR CHEMISTRY</b>	After completing this course, students should be able to construct a rational research proposal to generate fruitful output in terms of publications and patents in the field of chemical sciences.
	<b>CHE-HE-6056 DISSERTATION</b>	After completing this course, students will be able to do project work in different organizations along with research institute in the field of chemical sciences.
<b>COURSE OUTCOME (GENERIC ELECTIVE COURSE FOR REGULAR CORE COURSE)</b>		
<b>SEMESTER</b>	<b>PAPER &amp; COURSE</b>	<b>OUTCOMES</b>
<b>Semester I</b>	<b>CHE-RC-1016 CHEMISTRY1 ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY &amp; ALIPHATIC HYDROCARBONS</b>	After completion of this course the students will learn the atomic structure through the basic concepts of quantum mechanics. They will understand the chemical bonding through VB and MO approaches. In organic part, the students are expected to learn basic ideas used in organic chemistry, stereochemistry, functional groups, alkanes, alkenes, alkynes etc.
<b>Semester II</b>	<b>CHE-RC-2016 CHEMISTRY2 s- AND p-BLOCK ELEMENTS, TRANSITION ELEMENTS, COORDINATION CHEMISTRY STATES OF MATTER &amp; CHEMICAL KINETICS</b>	After completion of this course the students will learn periodic properties in main group elements, transition metals (3d series). They will also learn the crystal field theory in coordination chemistry unit. In physical chemistry part, the students are expected to learn kinetic theory of gases, ideal gas and real gases, surface tension, viscosity, basic solid state chemistry and chemical kinetics.
<b>Semester III</b>	<b>CHE-RC-3016 CHEMISTRY 3 CHEMICAL ENERGETICS, EQUILIBRIA &amp; FUNCTIONAL ORGANIC CHEMISTRY-I</b>	After completion of this course the students will be able to understand the chemical system from thermodynamic points of view. They will also learn two very important topics in chemistry- chemical equilibrium and ionic equilibrium. In organic chemistry part, the students are expected to learn various classes of organic molecules-alkyl halides, arylhalides, alcohols, phenols, ethers, aldehydes and ketones.
	<b>CHE-SE-3034 BASIC ANALYTICAL CHEMISTRY</b>	Upon completion of this course, students shall be able to explain the basic principles of chemical analysis, design/implement microscale and semimicro experiments, record, interpret and analyze data following scientific methodology.
<b>Semester IV</b>	<b>CHE- RC-4016 CHEMISTRY 4 SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE, ELECTROCHEMISTRY &amp; FUNCTIONAL GROUP ORGANIC CHEMISTRY</b>	After completion of this course the students learn solutions, phase rule and its application in specific cases, basics of conductance and electrochemistry. Students will also learn some important topics of organic and biochemistry- carboxylic acids, amines, amino acids, peptides, proteins and carbohydrates.
	<b>CHE-SE-4014 ANALYTICAL CLINICAL BIOCHEMISTRY</b>	Students will be able to identify various molecules relevant to a particular pathological condition and their estimation protocols.
<b>COURSE OUTCOME (REGULAR ELECTIVE COURSE)</b>		
<b>Semester V</b>	<b>CHE-RE-5016 APPLICATIONS OF</b>	After the completion of this course it will help the student to interpret laboratory data, curve fitting of experimental work, also perform quantum

	<b>COMPUTERS IN CHEMISTRY</b>	mechanical calculations for various molecular models.
	<b>CHE-RE-5026 ANALYTICAL METHODS IN CHEMISTRY</b>	On successful completion students will have theoretical understanding about choice of various analytical techniques used for qualitative and quantitative characterization of samples. At the same time through the experiments students will gain hands on experience of the discussed techniques. This will enable students to take judicious decisions while analyzing different samples.
	<b>CHE-SE-5014 CHEMICAL TECHNOLOGY &amp; SOCIETY</b>	Students shall be familiarized with processes and terminologies in chemical industry, like mass balance, energy balance etc... Learners will be able to use chemical and scientific literacy as a means to better understand the topics related to the society.
<b>Semester VI</b>	<b>CHE-RE-6016 GREEN CHEMISTRY</b>	Apart from introducing learners to the principles of green chemistry, this course will make them conversant with applications of green chemistry to organic synthesis. Students will be prepared for taking up entry level jobs in the chemical industry. They also will have the option of studying further in the area.
	<b>CHE-RE-6026 INDUSTRIAL CHEMICALS AND ENVIRONMENT</b>	After successful completion of the course, students would have learnt about the manufacture, applications and safe ways of storage and handling gaseous and inorganic industrial chemicals. Students will get to know about industrial metallurgy and the energy generation industry. Students will also learn about environmental pollution by various gaseous, liquid wastes and nuclear wastes and their effects on living beings. Finally, the students will learn about industrial waste management, their safe disposal and the importance of environment friendly "green chemistry" in chemical industry.
	<b>CHE-RE-6036 INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE</b>	This course will establish the basic foundation of industrial inorganic chemistry among the students. This will be helpful for pursuing further studies of industrial chemistry in future. Experiments will help the Students to gather the experience of qualitative and quantitative chemical analysis. Students will be capable of doing analysis of the inorganic materials which are used in our daily life. They will have insight of the industrial processes.
	<b>CHE-RE-6046 RESEARCH METHODOLOGY FOR CHEMISTRY</b>	After completing this course, students should be able to construct a rational research proposal to generate fruitful output in terms of publications and patents in the field of chemical sciences.
	<b>CHEM-HE-6056 Dissertation</b>	Student will complete a project work and then prepare a report on that.
	<b>CHE-SE-6014 CHEMISTRY OF COSMETICS &amp; PERFUMES</b>	Students will learn about the preparation and chemistry involved with the production different cosmetic. This may encourage students to take up entry level jobs at cosmetics industry or venture into commercial production of cosmetics as an entrepreneur.
	<b>CHE-SE-6024 PESTICIDE CHEMISTRY</b>	Students will be able to explain or describe and critically examine different types of pesticides, their activity/toxicity and their applications and the need for the search of an alternative based on natural products.
	<b>CHE-SE-6034 FUEL CHEMISTRY</b>	At the end of this course students will learn about the classes of renewable and non-renewable energy sources. Students will learn about the composition of coal and crude petroleum, their classification, isolation of coal and petroleum products and their usage in various industries. They will also learn to determine industrially significant physical parameters for fuels and lubricants.

