

## **COURSE OUTCOMES & PROGRAMME OUTCOMES**

### **ABHAYAPURI COLLEGE, ABHAYAPURI**

#### **EDUCATION**

##### **Course Structure of B.A. Education (Honours) under CBCS**

It aims 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.

##### **Instruction on Teaching Method:**

- The classroom transaction of all the papers will be done through Blended mode of learning. However, offline learning will be conducted through lectures, group discussions, experiential exercises, projects, presentations, workshops, seminars and hands on experiences.

- Students would be encouraged to develop an understanding of real life issues and participate in the programs and practices in the social context. To this end, practicum is incorporated as an important component in many of the papers.

- Use of ICT and mass media and web based sources is highly recommended to make the teaching learning process interactive and interesting.

- 40% of the courses will be covered by online mode of learning.

**Evaluation:** The mode of evaluation would be through a combination of external and internal assessment in the ratio of 80: 20 respectively. Equal weightage will be given to all the units while setting of questions papers in external examination. Along with routine examinations, classroom participations, class assignments, project work, and presentations would also be a part of the overall assessment of the student.

#### **1<sup>st</sup> SEMESTER (HONOURS)**

**EDU-HC-1016**

#### **PRINCIPLES OF EDUCATION**

**Total Marks: 100 (External: 80 and Internal: 20)**

**Credit-6**

##### **Course Outcomes:**

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

- Acquaint the students with the sound principles of education
- Acquaint the students with the 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.
- Familiarise the students with democratic idea of modern education.

**EDU-HC-1026**  
**PSYCHOLOGICAL FOUNDATIONS OF EDUCATION & LABORATORY**  
**PRACTICAL**

**Total Marks: 100 (External: 80 and Internal: 20)**

**Credit-6**

**Course Outcomes:**

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

- Make the students understand the relationship between education and psychology.
- Explain the need of educational psychology in teaching learning process.
- Describe the nature and theories of learning and role of motivation in learning.
- Understand the concept of memory, forgetting, attention and interest.
- Understand intelligence, its theories and measurement.
- Acquaint with different types of personality and the adjustment mechanism.

**EDU-HG-1016**

**FOUNDATIONS OF EDUCATION**

**Total Marks: 100 (External: 80 and Internal: 20)**

**Credit-6**

**Course Outcomes:**

After completion of this course the learner will be able to

- Acquaint with the principles of education
- Gain knowledge about different various 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.

**2<sup>nd</sup> SEMESTER (HONOURS)**

**EDU-HC-2016**

**PHILOSOPHICAL AND SOCIOLOGICAL FOUNDATION OF EDUCATION**

**Total Marks: 100 (External: 80 and Internal: 20)**

**Credit-6**

**Course Outcomes:**

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 socialisation.

**EDU-HC-2026**  
**DEVELOPMENT OF EDUCATION IN INDIA-I**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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

**EDU-HG-2016**  
**PSYCHOLOGY OF ADOLESCENTS**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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

- Enable the students to understand the period of adolescence
- Enable the students to understand the significance of the adolescence period in human life
- Enable the students to know about various problems associated with this stage
- Enable the students to understand the development aspects of adolescence, importance of adolescence period and problems associated with this stage.

**3<sup>rd</sup> SEMESTER (HONOURS)**

**EDU-HC-3016**  
**DEVELOPMENT OF EDUCATION IN INDIA-II**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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

**EDU-HC-3026**  
**EDUCATIONAL TECHNOLOGY AND TEACHING METHODS**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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

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

**EDU-HC-3036**  
**VALUE AND PEACE EDUCATION**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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.

**EDU-HG-3016**  
**GUIDANCE AND COUNSELLING**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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

- Help the students to understand the concept, need and importance of Guidance and Counselling
- Enable the students to know the different types and approaches to Guidance and Counselling
- Acquaint the students with the organization of guidance service and school guidance clinic
- Enable the learners to understand the challenges faced by the teacher as guidance worker.

**EDU-SE- 3014**  
**PUBLIC SPEAKING SKILL**  
**Credit – 4**

**Course Outcome:**

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

**Guidelines:**

- The students will be trained on public speaking
- Teachers will give demonstrations on public speaking
- It will cover: Style of presentation, voice modulation, body language, communication with audience, eye contact
- Topics of speech will be selected by the students discussing with teachers.
- Topic of write-up will be decided by the internal examiner.
- Word limit for the write-up is maximum 2000.

**Mode of Delivery:**

Teachers should use lecture, demonstration and any other method as per required for explaining the contents for the students.

**Evaluation Plan:**

- For theory part, written examination will be conducted with 50 marks.
- Evaluation for practical examination (Public Speaking Skill+Write-up of the speech) will be done by an External Examiner.

**4<sup>th</sup> SEMESTER (HONOURS)**

**EDU-HC-4016**  
**GREAT EDUCATIONAL THINKERS**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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

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

**EDU-HC-4026**  
**EDUCATIONAL STATISTICS AND PRACTICAL**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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

- Develop the basic concept of Statistics,
- Be acquainted with different statistical procedures used in Education.
- Develop the ability to represent educational data through graphs.
- Familiarize the students about the Normal Probability Curve and its applications in Education.

**EDU-HC-4036**  
**EMERGING ISSUES IN EDUCATION**  
**Total Marks: 100 (External=80 and Internal=20)]Credit-6**

After completion of this unit, students will able to-

- Make the students acquaint with major emerging issues national, state, and local
- Acquaint the students with the various issues in education that are emerging in the recent years in the higher education system
- Address the various problems and challenges of education in India at all levels.

**EDU-HG-4016**  
**HISTORY OF EDUCATION IN INDIA**  
**Marks: 100 (External: 80 Internal: 20)**  
**CREDIT: 6**

**Course Outcomes:**

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.

**EDU-SE-4014**  
**WRITING BIODATA AND FACING AN INTERVIEW**  
**Credit- 4**

**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.

## **5<sup>th</sup> SEMESTER (HONOURS)**

### **Instruction:**

- EDU-HC-5016 and EDU-HC-5026 papers are compulsory for all the 5<sup>th</sup> semester Honours students.
- In HE papers, students will have to select two papers from four alternatives. They can select first paper from EDU-HE-5016 or EDU-HE-5026 alternatives. And they can select the second paper from EDU-HE-5036 or EDU-HE-5046 alternatives.

**EDU-HC-5016**  
**MEASUREMENT AND EVALUATION IN EDUCATION & PRACTICAL**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

### **Course Outcomes:**

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

- Enable the students to understand the concept of measurement and evaluation in education.
- Acquaint the students with the general procedure of test construction and characteristics of a good test.
- Develop an understanding of different types of educational tests and their uses.
- Acquaint the students about personality test, and aptitude tests.

**EDU-HC-5026**  
**GUIDANCE AND COUNSELLING**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

### **Course Outcomes:**

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

- Help the students to understand the concept, need and importance of Guidance and Counselling
- Enable the students to know the different types and approaches to Guidance and Counselling
- Acquaint the students with the organization of guidance service and school guidance clinic
- Enable the learners to understand the challenges faced by the teacher as guidance worker.

**EDU-HE-5016**  
**CONTINUING EDUCATION**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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

- Know the concept, objectives, scope and significance of continuing education in the context of present scenario.
- Understand about different aspects and agencies of continuing education.
- Realize different methods and techniques as well as issues of continuing education.
- Know the meaning of open education and realise the importance of open school and open universities in continuing education.
- Understand the development of adult education in India, kinds of adult education and different problems of adult education.

**EDU-HE-5026**  
**DEVELOPMENTAL PSYCHOLOGY**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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

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

**EDU-HE-5036**  
**HUMAN RIGHTS EDUCATION**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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

- Explain the basic concept, nature and scope of human rights
  - Describe the meaning, nature, principles, curriculum and teaching methods of human rights education at different levels of Education.
  - Know the role of United Nations on human rights
  - Understand enforcement mechanism in India
  - Know the role of advocacy groups



**EDU-HE-5046**  
**TEACHER EDUCATION IN INDIA**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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

**6<sup>th</sup> SEMESTER (HONOURS)**

**Instruction:**

- EDU-HC-6016 and EDU-HC-6026 papers are compulsory for all the 6<sup>th</sup> semester Honours students.
- In HE papers, students will have to select two papers from four alternatives. They can select first paper from EDU-HE-6016 or EDU-HE-6026 alternatives. And they can select the second paper from EDU-HE-6036 or EDU-HE-6046 alternatives.

**EDU-HC-6016**  
**EDUCATION AND DEVELOPMENT**  
**Total Marks: 100 (External: 80 and Internal: 20)**  
**Credit-6**

**Course Outcomes:**

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

## **EDU-HC-6026**

### **PROJECT**

**Total Marks: 100 (External: 80 and Internal: 20)**

**Credit-6**

#### **Course Outcomes:**

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

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

#### **Guideline:**

Each student is required to complete anyone project related to any area of the syllabus to be evaluated by Internal and External Examiners jointly through viva-voce test. The project work will be completed according to following heads:

- Title of the Project
- Introduction
- Importance of the Study
- Objectives of the Study
- Review of related literature (if any)
- Methods and Procedure
- Data Analysis and Discussion
- Conclusion

## **EDU-HE-6016**

### **MENTAL HEALTH AND HYGIENE**

**Total Marks: 100 (External: 80 and Internal: 20)**

**Credit-6**

#### **Course Outcomes:**

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

- Acquaint with the fundamentals and development of mental health and the characteristics of a mentally healthy person.
- Understand the concept and importance of mental hygiene and its relationship with mental health.
- Acquire knowledge about the principles, factors promoting mental health and the role of home, school, and society in maintaining proper mental health.
- Learn the meaning and problem of adjustment and also the different adjustment mechanisms.
- Familiarise with the concept and issues of positive psychology, mental health of women, role of WHO and stress management.

## **EDU-HE-6026**

### **SPECIAL EDUCATION**

**Total Marks: 100 (External: 80 and Internal: 20)**

**Credit-6**

#### **Course Outcomes:**

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
- Familiarise the students with the different types of special children with their characteristics

- Enable the students to know about different issues, educational provisions and support services of special education

**EDU-HE-6036**

**EDUCATIONAL MANAGEMENT**

**Total Marks: 100 (External: 80 and Internal: 20)**

**Credit-6**

**Course Outcomes:**

After completion of this course the learner will be able to

- Develop an understanding of the basic concept of educational management.
- Enable the students to know about the various resources in education
- Enable the students to understand the concept and importance of educational planning.
- Enable the students to know about the financial resources and financial management in education.

**EDU-HE-6046**

**WOMEN AND SOCIETY**

**Total Marks: 100 (External: 80 and Internal: 20)**

**Credit-6**

**Course Outcomes:**

After completion of this course the learner will be able to

- Know the changing role of women in India
- Understand gender discrimination in Indian society
- Make the students understand the constitutional provisions for women and their rights.
- Make the students understand women empowerment
- Develop an awareness and sensitivity towards women

\*\*\*

## DEPARTMENT OF ECONOMICS

### PROGRAMME OUTCOME OF ECONOMICS UNDER C.B.C.S OF GAUHATI UNIVERSITY

#### Core paper-1

**Introductory Microeconomic-** Students will be able to learn the basic principles of microeconomic theory. They will learn how microeconomic concepts can be applied to analyze real-life situations.

#### Core paper-2

**Mathematical Methods for Economics-I** -The students will learn the method of applying mathematical techniques to economic theory in general.

#### Core paper-3

**Introductory Macroeconomics** –The students will learn the preliminary concepts associated with the determination and measurement of aggregate macroeconomic variable like savings, investment, GDP, money, inflation, and the balance of payments.

#### Core paper-4

**Mathematical Methods for Economics-II:** The students will learn the method of applying mathematical techniques to economic theory in general. They will also learn Linear algebra, Functions of several real variables, Multi-variable optimization and Differential equation.

#### Core paper- 5

**Intermediate Microeconomics-1** The course will be helpful to students to provide a sound training in microeconomic theory to formally analyze the behavior of individual agents.. This course will help the students to understand the behavior of the consumer and the producer and also covers the behavior of a competitive firm.

#### Core paper-6

**Intermediate Macroeconomics 1** Students will learn 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 will also introduce the students to various theoretical issues related to an open economy.

#### Core paper-7 :

**Statistical Methods for Economics:** Students will be able to learn the notion of probability, probability distributions of discrete and continuous random variables and of joint distributions. This course will also help the students to understand sampling techniques used to collect survey data, sampling distributions that act as a bridge between probability theory and statistical inference. Core paper-8 Intermediate Microeconomics-ii

#### Core paper-8

**Intermediate Microeconomics-ii** Students will learn the general equilibrium and welfare, imperfect markets and topics under information economics.

### **Core paper-9**

**Intermediate Macroeconomics-ii** The student will learn the long run dynamic issues like growth and technical progress. They will also be familiar with the micro-foundations to the various aggregative concepts .

### **Core paper-10 :**

**Introductory Econometrics:** The students will learn the basic econometric concepts and techniques, concepts of hypothesis testing, estimation and diagnostic testing of simple and multiple regression models.

### **Core paper-11.**

**Indian Economy-I** The outcome of this paper is to make students aware of the major trends in economic indicators and policy debates in India in the post-Independence period, with particular emphasis on paradigm shifts and turning points.

### **Core paper-12**

**Development Economics-**The course is designed to make the student learn the alternative conceptions of development and their justification, aggregate models of growth and cross-national comparisons of the growth experience

### **Core paper-13**

**Indian Economy-II** Students will learn the examination of sector-specific policies and their impact in shaping trends in key economic indicators in India.

### **Core paper-14 :**

**Development Economics-II** The student can learn the basic demographic concepts and their evolution during the process of development, the governance of communities and organizations, sustainable growth, globalization and increased international dependence on the process of development.

### **DISCIPLINE SPECIFIC ELECTIVE (DSE) PAPERS:**

1. **ECONOMICS OF HEALTH AND EDUCATION**—The student will learn about achieving universal primary education, reducing child mortality, improving maternal health and combating diseases. This course provides a microeconomic framework to analyze, among other things, individual choice in the demand for health and education, government intervention and aspects of inequity and discrimination in both sectors.
2. **MONEY AND FINANCIAL MARKETS**-----The students are aimed to make aware of functioning of the monetary and financial sectors of the economy, the organization, structure and role of financial markets and institutions, interest rates, monetary management and instruments of monetary control. Financial and banking sector reforms and monetary policy with special reference to India
3. **PUBLIC FINANCE** ----- The student can learn 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.

4. **ENVIRONMENTAL ECONOMICS---** Students will be able to learn the economic principles applied to environmental questions and their management through various economic institutions, economic incentives and other instruments and policies.
5. **INTERNATIONAL ECONOMICS---** The students will learn composition, direction and consequences of international trade, and the determinants and effects of trade policy. They will also have an insight to the causes and consequences of the rapid expansion of international financial flows in recent year.
6. **THE ECONOMY OF ASSAM** The outcome of the paper is to make students aware of the Assam economy with specific emphasis on the problems facing the economy and the remedies as well.

### **SKILL ENHANCEMENT COURSE (PAPERS)**

**1 DATA COLLECTION AND PRESENTATION---** The student will learn the use of data, presentation of data using computer software like MS-Excel. Students will be involved practically to preparation of questionnaires/interview schedules, collection of both primary and secondary data and its presentation.

**2 DATA ANALYSIS** The students will learn how data can be summarized and analyzed for drawing statistical inferences. The students will also learn important data sources that are available and will learn the use of statistical software like SPSS/PSP to analyze data.

### **REGULAR COURSES**

- |  |                          |
|--|--------------------------|
| <b>1. PRINCIPLES OF MICROECONOMICS-I</b>             | <b>As stated earlier</b> |
| <b>2. PRINCIPLES OF MICROECONOMICS-II</b>            | <b>As stated earlier</b> |
| <b>3. PRINCIPLES OF MACROECONOMICS-I</b>             | <b>As stated earlier</b> |
| <b>4. PRINCIPLES OF MACROECONOMICS-II</b>            | <b>As stated earlier</b> |
| <b>5. ECONOMIC DEVELOPMENT AND POLICY IN INDIA-I</b> |                          |

The students will learn the major trends in aggregate economic indicators in India and places these against the backdrop of major policy debates in India in the post- Independence period.

### **6. MONEY AND BANKING**

The Students will be able to learn the functioning of the monetary and financial sectors of the economy, the organization, structure and role of financial markets and institutions, interest rates, monetary management and instruments of monetary control, Financial and banking sector reforms and monetary policy with special reference to India.

- 1. ENVIRONMENTAL ECONOMICS : As stated earlier**

### **8 ECONOMIC DEVELOPMENTS AND POLICY IN INDIA-II**

Students are expected to learn and examine sector-specific trends in key indicators and their implications in the post-Independence period of India

- 9. ECONOMIC HISTORY OF INDIA 1857-1947**—The students will learn the analyses of key aspects of Indian economic development during the second half of British colonial rule.

**10. PUBLIC FINANCE---** As stated earlier

**GENERIC ELECTIVE**

**1 ECONOMIC DEVELOPMENT AND POLICY IN INDIA-I---**As stated earlier.

**2 ECONOMIC DEVELOPMENT AND POLICY IN INDIA-II ---**As stated earlier.

## Department of English

### PROGRAMME SPECIFIC OUTCOME (PSO)

#### SEMESTER I

##### CC I : INDIAN CLASSICAL LITERATURE

1. *"Abhijnana Shakuntalam" : Kalidasa (18 class hours)*

This text is a key to enter into the treasure of Indian Classical literature. It is a play in 7 acts that accentuates eternal human endeavour to unite earth and heaven. A reading of *Shakuntalam* is meant for exposure to and understanding of pure literature.

2. *"The Dicing" and "The Sequel to Dicing" from The Mahabharata : Vyasa (7+5=12 class hours)*

It makes an introduction to Indian Epic tradition. Translinguistic in nature, this text is meant for mature understanding of life through the challenging characters like Duryodhana and Shakuni. Students can form a new perception about the binary nature of moral and cultural ethos of India in those days.

3. *"Mricchakatika" : Sudraka (17 class hours)*

Another Indian play in translation IN 10 acts. It is a play that deals with the ground realities of medieval India. It is a 'Prakarana' play that gives exposure to life in all its vagaries. The kaleidoscopic vision of the play will attract the young minds to the multi-layered social setup of the then times, and thus, may draw them to deeper studies on Indian history, culture, and class systems.

4. *"The Book of Vanci" from "Cilappatikaram" : Ilanko Atikal (15 class hours)*

It is a Tamil epic which marks a distinct departure from the Aryan epic tradition. Lyrical and melodious, this epic is romantic in nature, and it suggests a transcendence from the mundane world to the ethereal heaven. It tells the tale of universal human saga of Love, Revenge, War and Power, although from a Dravidian angle.

##### CC II : EUROPEAN CLASSICAL LITERATURE

1. *"The Iliad" ( Book I and Book IX) : Homer (17 class hours)*

A key to enter into the European Classical literature, "The Iliad", even in excerpts, is worth reading. It presents the heroic life of the Indo-European forefathers. Ennobling and exotic, this text makes an interesting parallel with the Indian epics. Students may avail themselves of the opportunity of probing into a comparative study of the different structure and texture of the Oriental and the Occidental epics.

2. *"Oedipus the King" : Sophocles (17 class hours)*



One of the greatest tragedies of all time, "Oedipus Rex" presents the irony of human existence and ego-centric megalomania through the metaphor of vision. Deeply philosophical in nature, this play, through the tale of promiscuity of generations, tells the eternal saga of the sad music of humanity. Hence the enduring popularity of this text.

3. *"Poetics" : Aristotle (18 class hours)*

It makes a theoretical attempt to analyse literature primarily through the metaphor of tragedy. It is a must read for all students interested in literature, as it is the primal and seminal text on Aesthetics and Poetry in the West.

4. *Selections from "Metamorphoses" : Ovid (14 class hours)*

Ovid's "Metamorphoses" is another marvel of world literature. The selections are made keeping in mind the capacity of the students to understand them and their areas of interest. Apart from the interest that the stories generate, they also point to the universal interrelationship between the Mythical characters and the Human mind.

## **SEMESTER II**

### **CC III : INDIAN WRITING IN ENGLISH**

*"The Guide": R.K. Narayan (17 class hours)*

The Guide is an immensely popular modern Indian English fiction that addresses intricate issues of Indianism through a well-told story. Reading of such a text is worth its while as it introduces students adequately to the concept of Indian English literature.

*"In Custody" : Anita Desai (17 class hours)*

A novel short-listed for Booker, "In Custody" experiments boldly with a crisis that always demands careful handling : the conflict between Hindi and Urdu after the independence of India. Students will surely find it worth reading.

*Indian English Poetry (16 class hours)*

Indian students studying literature in British India were first enamoured by English poetry, and they started imitating them slavishly at first, with some character and purpose. Modern Indian English poetry is worth reading, and students will definitely be benefited by this exposure.

*Indian English Short Stories and Essays (18 class hours)*

Indian English shows its optimum maturity in fictional works, and short stories comprise a good slice of it. It is always advisable that students should be encouraged to read Indian English short stories by R.K.Narayan, Mulk Raj Anand and Khuswant Singh, and essays by Salman Rushdie and Amitava Ghosh are also worth reading.

### **CC IV : BRITISH POETRY AND DRAMA : 14TH TO 17TH CENTURY**

*"The Wife of Bath's Prologue" : Geoffrey Chaucer (7 class hours)*

*Poetry from Spenser to Marvell (8 class hours)*

The students are introduced to English literature with the best poems from Chaucer to the Metaphysicals. This exposure makes them ready to face other challenges in the semesters to come. With Chaucer, modern English begins, and he is justly called the Father of English Literature. Students are encouraged to go through the development of English language and poetry from Chaucer to Marvell.

*"Edward II" : Christopher Marlowe (20 class hours)*

This tragedy is the first of the English plays that students face. This intricate text with historical background prepares them to come across "Macbeth", "Hamlet" and "Henry IV" in future. The political dimension of power clash is also important for young minds. This play is of triple benefit for the students because it accommodates three major components of Elizabethan theatre : Tragedy, History play, and Chronicle play.

*"Macbeth" : William Shakespeare (20 class hours)*

"Macbeth" is the shortest of the Shakespearean tragedies and the swiftest. So it is almost an automatic choice, and students are immensely benefitted by reading this thrilling tragedy. It is at once a gripping moral and political play and a cascade of silvery poetry. It is one of the earliest examples of the Theatre of Power.

*"As You Like It" : William Shakespeare (20 class hours)*

This romantic comedy is the first one of the genre that students take up. It is a pleasant drama that presents a vision of life quite opposite to that of Edward II and Macbeth. Through the form of Romantic Comedy of geniality, humour and fun, Shakespeare projects the deeper theme of social cleansing and purification, which is of utmost importance to the moral make of the learners' minds.

### **SEMESTER III**

#### **CC V : AMERICAN LITERATURE**

*"The Hairy Ape" : Eugene O'Neill (18 class hours)*

This impressionistic text is the first of the modern American plays that is offered to the students considering the fact that they are now maturer to accept intellectual challenges. The play makes the students aware about the primitive violence and political power clash inherent in the history of humanity.

*"The Old Man and the Sea" : Ernest Hemingway (18 class hours)*

A fictional presentation of Americanism, this work is a must read for anybody interested in literature or life. The tragic adventurism of the old man is a lesson for young students to understand the ultimate philosophical reality that every human enterprise has its own worth beyond the human calculation of profit or loss. The element of 'struggle for existence' is powerfully portrayed through the central character, which every man should learn in order to

make a mark in life.

*American Short Stories : (16 class hours)*

No reading of American literature is complete without short stories by Poe or Faulkner. The concept of America as a "melting pot" and the American dream finds expression mostly through the essays and short stories. So the component is very interesting.

*American Poetry (18 class hours)*

American poetry starting from Anne Bradstreet to Robert Frost creates a sense of historical continuity and development. Poetry is the essence of literature and reading of these poems alongside British and Indian will definitely help students to perceive the underlying philosophy.

#### **CC VI : POPULAR LITERATURE**

*"Through the Looking Glass" : Lewis Carrol (18 class hours)*

Lewis Carrol creates a world of non-sense that draws attention of readers from 8 to 80. This popular appeal, now recognized in literature, is part of making a student ready to face any challenge in the field of literature. This unparallel piece projects one of the central tensions of life : the polar tension between Logic and Imagination.

*"The Murder Of Roger Ackroyd" : Agatha Christie (18 lectures)*

Detective fiction as a popular genre finds place to initiate the students to a world of murder, mystery and mathematics. It is important for all-round development of literary sensibility of the students.

*Three men in a Boat : Jerome K. Jerome (17 class hours)*

This very handy and hilarious story is a good dose of laughter medicine for students. It is hoped that such fiction will go well with a modern student surrounded by internet, website, cartoon network and cloud.

*"Bhimayana : Experiences of Untouchability" : Vyam and Vyam (17 class lectures)*

It is a graphic novel and a biography of Bhimrao Ramji Ambedkar. It serves the dual purpose of education and entertainment through a now- popular genre of fiction.

#### **SEMESTER IV**

#### **CC VIII : BRITISH LITERATURE : 18TH CENTURY**

*English Essays : (14 class hours)*

Essays are an important part of modern English literature, and reading of 18th century essays by Steele and Addison is helpful in understanding 18th century life and society better.

*"Gulliver's Travels" (Book I and Book II) : Jonathan Swift (22 class hours)*

This fictional work is now considered a classic because of the inherent allegorical message. Reading of this work will definitely inspire students to contemplate boldly and independently on the issues of their own world, and to distinguish between the 'Apparent' and the 'Real'.

*Poetry of Gray and Collins (12 class hours)*

The Pre-Romantic English poetry paves the ground for the famous Romantic tradition. The poems prescribed are lucid and enjoyable. Students will be surely benefited by this component, and will be exposed to the world of imagination to which the 18th and 19th century paid their high tributes.

*"The Castle of Otranto" : Horace Walpole (22 class hours)*

It is the first specimen of Gothic fiction, and this work will definitely help the students read other fictions of this genre and be inspired to see the film versions that will expand their imagination and help them to relate literature of terror with the sensations of day to day life.

## **CC IX : BRITISH ROMANTIC LITERATURE**

*Poems of Blake and Scott (11 class hours)*

It is a continuation of the Romantic tradition, and the poems of Blake and Scott are very important to understand the basic nuances of Romanticism. Students, already reading Gray and Collins, will definitely be interested in this segment. The students will also be made aware of the pivotal role of Music and Painting in poetry.

*Poems of Wordsworth and Coleridge (15 class hours)*

High Romanticism is explored through this segment. Students are introduced to the poems they have been hearing of from parents and teachers in their school days.

*Poems of Shelley and Keats (15 class hours)*

High Romanticism continues. Students are supposed to be immensely benefitted by the inspired imagination and recreation of truth as epitomized by the great Romantics.

*Essays of Charles Lamb : (18 class hours)*

Charles Lamb is called the prince of English essays. Reading an essay by him is an experience itself. Students will gain knowledge about facing all problems with a smile if they perceive the philosophy of Lamb.

## **CC X : BRITISH LITERATURE : 19TH CENTURY**

*:Pride and Prejudice" : Jane Austen (18 class hours)*

The first great woman novelist in English, Jane Austen presents her simple, rural vision of life in all her novels. "Pride and Prejudice" is a great novel that presents the late 18th century English society in a very sketchy way. Reading of this novel will definitely help students relate the realities of Indian society.

*"Hard Times" : Charles Dickens (18 class hours)*

The novel presents in typical Dickensian way the socio-economic realities of mid-19th century England. The students will get the taste of Dickens, and they can relate the realities of post-globalization with what Dickens presents in Hard Times : the stark materialism and the curses of Industrialisation in 19th century England in particular, and Europe as a whole.

*"The Return of the Native" : Thomas Hardy (18 class hours)*

Another great novel of 19th century that presents provincial realities in a well-told story of love and loss. Hardy's philosophy has a universal appeal, and students will find his world fascinating. They will also learn to look at Nature and Society with a different eye.

*Poems by Tennyson, Browning and Arnold (16 class hours)*

Victorian poetry is expressive of the disturbing realities of the age. So there is an inherent complexity within the surface look of simplicity. Students will find the difference between Romantic poetry and Victorian ones very interesting. Victorian poetry being both a continuation of Romanticism (which germinated from a failed French Revolution), and an anticipation of the 20th century War crisis, it focuses on the central theme of Loss of Faith and Love in an industrialised and war-sickened world.

## **SEMESTER V**

### **CC XI : WOMEN'S WRITINGS**

*Poems of Dickinson, Plath & D'Souza (12 class hours)*

The poems are representative of how conscious, modern women address their inner feelings and Women's issues as a part of human dichotomy. Reading of their poems will enhance the level of perception of the 3rd year students already exposed to World Literature, and will be exposed to the critical arena of Feminism.

*"Uncle Tom's Cabin" : Harriet Beecher Stowe (18 class hours)*

The world famous fiction that exposes the realities of the American attitude to the Blacks is worth reading for any lover of literature. The students will definitely be enriched by the humanitarian approach of Stowe, and be able to identify the curses of Apartheidism.

*Short Stories by Mansfield, Jhumpa Lahiri & Mahasweta Devi (21 class hours)*

The unit will give a good exposure to the students through short stories of sensibilities as different as Kiwi, Netizen and Indian. It is hoped that students are by now ready to accept such challenges. The multiple facets of existence, viz., 'Struggle for existence', 'Diasporic dislocation', and 'Tribal resistance' will lead the students to an all-round perception of life's fights.

*Essays by Virginia Woolf and Memoirs by Rassundari Devi (16 class hours)*

The two essays by Virginia Woolf directly address feminine issues and the Memoirs of Rassundari Devi presents the development of feminine sensibility in India during the second half of the 19th century in India. So, the East-West combine of Feminine crises and complexities, presented in the package of literature, will bring to the fore the universal problems of the so-called 'weaker sex' so far suppressed by the patriarchal society.

## **CC XII : BRITISH LITERATURE : EARLY 20TH CENTURY**

*"Arms and the Man" : G.B.Shaw (18 class hours)*

A pleasant comedy by G.B.Shaw, "Arms and the Man" incorporates strong anti-war message within the feel of anti-romanticism. It is a must-read for the students of English literature for its anti-war stance, conviction and popularity.

*Short stories by Lawrence and Maugham (14 class hours)*

The students will be immensely benefitted by reading the two masters of English literature. The complexities of modernist literature, when unravelled, will lead to aesthetic realisation.

*"A Portrait of the Artist as a Young Man" : James Joyce (20 class hours)*

The celebrated quasi-autobiographical novel by Joyce poses an intellectual challenge to the readers of any standard. It is a good exposure for the mature 3rd year students to cope up with the bitter realities of the modernist world and a successful transcendence through it.

*Poems of W.B.Yeats & T.S.Eliot (18 class hours)*

No less challenging and daunting is to face the poetry of Yeats and Eliot, but the readings will definitely be surprisingly revealing and pleasant. It is hoped that the students will gain in maturity by such readings to face the challenges beyond the college successfully.

## **SEMESTER VI**

### **CC XIII : MODERN EUROPEAN DRAMA**

*"Ghosts" : Henrik Ibsen (17 class hours)*

Ibsen is one of the most talked-about playwrights of the *Avant-Garde* movement. *Ghosts* is a scathing commentary on 19th century morality. It deals with religion, venereal disease, incest and euthanasia, some of the burning problems of the modern world. Students will be definitely benefitted by the reading of the play.

*"Mother Courage and Her Children" : Bertolt Brecht (18 class hours)*

This text of Brecht is immensely popular and frequently adapted. It is considered as the greatest anti-war play of all times, the reading of which will surely be enjoyable and beneficial to the students, as they will be exposed to the worldwide cry against War and for Peace.

*"Cherry Orchard" : Anton Chekov (17 class hours)*

A representative Russian play, *Cherry Orchard* shows a new dimension of social class structure. The play presents themes of cultural futility as the aristocracy makes vain efforts to maintain status and the bourgeois to find meaning in its new-found materialism. Students will be exposed to the Russian socio-political changes from the mid-nineteenth century to the first half of the 20th.

*"Rhinoceros" : Eugene Ionesco (18 class hours)*

A highly experimental absurd play, *"Rhinoceros"* created a new wave in *Avant-Garde* theatre movement. The play is often read as a response and criticism to the sudden upsurge of Fascism and Natzism, and explores the themes of conformity, culture, responsibility, mass movements, philosophy and morality. A bit tricky and subtle though it is, the play is worth reading on the part of the advanced learners of literature.

#### **CC XIV : POSTCOLONIAL LITERATURES**

*"Things Fall Apart" : Chinua Achebe (18 class hours)*

This novel addresses the socio-cultural realities of Nigeria with a historical consistency as a form of resistance to the kind of presentation of Africa in the colonial discourse. Our students should know such postcolonial discourses as our country also suffered from the same kind of repressive designs of the colonial masters during the British rule.

*"Mystic Masseur" : V.S.Naipaul (18 class hours)*

V.S.Naipaul, the master delineator of comical tragedy, writes *"Mystic Masseur"* as a comic novel about a frustrated writer of Indian descent. Set in the West Indian island of Trinidad, the novel is a satirical commentary on the nature of political ascendancy. It has a direct relevance to the decline of political ethos all over the world, and the students must find it worth reading.

*Poems by African Women Writers (18 class hours)*

The postcolonial literature is incomplete without the contribution of female writers across the globe. The development of African feminine sensibility in the last fifty years is amazingly fast, and the poems of Bessie Head, Ama Ata Aidoo and Grace Ogot will definitely inspire the students to explore them more and more.

*Postcolonial Poetry (16 class hours)*

Postcolonial literature is an amazingly thriving field as hundreds of writers are addressing the colonised realities in newer veins. Neruda speaks of Latin American realities, Derek Walcott Caribbean, David Malouf Australian, and Mamang Dai North-East Indian. Reading of literature will not be complete without some bit of knowledge of these masters of postcolonialism.



## **Department of Philosophy**

### **PHILOSOPHY HONOURS (CBCS)**

M. PHI-HC-1016 / Indian Philosophy 1

M. PHI-HC-1026/ Logic 1

M. PHI-HC-2036/ Greek philosophy

M.PHI-HC-2046/ Logic 2

M.PHI-HC-3056/ Western philosophy Descartes to Hegel

M.PHI-HC-3066/ Indian philosophy 2

M.PHI-HC-3076/ Ethics

M.PHI-HC-4086/ Contemporary western philosophy

M.PHI-HC-4096/ Philosophy of Religion

M. PHI-HC- 4106/ Political and social Philosophy

M.PHI-HC-5116/ Analytic Philosophy

M.PHI-HC-5126/ Phenomenology and Existentialism

M.PHI-HC-6136/ Philosophy of Mind

M. PHI-HC- 6146/ Meta Ethics

M. PHI-HC- 5016/ Philosophy of Upanisad ( 5<sup>th</sup> sem C.B.C.S Elective)

M. PHI-HC-5026/ Philosophy of Gita ( 5<sup>th</sup> sem C.B.C.S Elective)

M, PHI-HC-5036/ Isa Upanisad with Shankara Bhasya (Textual Study) (5<sup>th</sup> sem C.B.C.S Elective)

M.PHI-HC- / Textual study western philosophy (6<sup>th</sup> sem C.B.C.S Elective)

M.PHI-HC- / philosophy of Language (6<sup>th</sup> Sem C.B.C.S Elective)

M.PHI-HC - / Applied Ethics ( 6<sup>th</sup> Sem C.B.C.S Elective)

i. Skill enhancement /

- o Reasoning and Logic
- o Critical Thinking

**Course outcome of CBCS B.A HONORS in philosophy**

**Course outcome of CBCS B.A HONORS in philosophy**

Paper	Outcome
Indian Philosophy (1 <sup>st</sup> and 3 <sup>rd</sup> sem C.B.C.S)	C.O 1 – Help us to know the spiritual aspect of Human life C.O.2 – Goals and Needs of human life to living a happy life.
Logic (1 <sup>st</sup> and 3 <sup>rd</sup> sem C.B.C.S )	C.O.1- Clarify our thoughts. C.O.2- Gives principles for correct and valid reasoning, which are essential for everyday life
western philosophy Descartes to Hegel(3 <sup>rd</sup> sem C.B.C.S)	C.O.1- provide knowledge about theistic view of universe C.O.2- knowing the concept of space and time
Contemporary western philosophy (4 <sup>th</sup> sem C.B.C.S and 5 <sup>th</sup> & 6 <sup>th</sup> sem Non-C.B.C.S)	C.O.1-provide knowledge of science with philosophy C.O.2- Help us to know about substance and self
Ethics (3 <sup>rd</sup> sem c.b.c.s )	C.O.1- Its teach us what is right and what is wrong? What to do and what not. C.O.1- It's developed our skill to articulating our own moral values.
political and social philosophy (4 <sup>th</sup> sem c.b.c.s)	C.O.1- Help us for the better understand of social issues and expounding their personal concept. C.O.2- provide knowledge about the relationship between Individual and society.
philosophy of Religion (4 <sup>th</sup> sem C.B.C.S)	C.O.-1 Understanding the concept of religion and its surrounding issues. C.O.2- Different viewpoints of religion.
Analytic philosophy (5 <sup>th</sup> sem C.B.C.S)	C.O.1- Introduction with analytic philosophy C.O.-2- understanding the relationship between language and reality.
Phenomenology and Existentialisms (5 <sup>th</sup> sem C.B.C.S)	C.O.1- Familiarity with the main lies of thought in phenomenological tradition. C.O.2- provides knowledge about phenomenological and existential approaches.
Philosophy of Mind (6 <sup>th</sup> sem C.B.C.S)	C.O.1- Experience in analyzing and critiquing written argument. C.O.2- Show improvement in problem solving and critical reasoning skill.

Meta Ethics (6 <sup>th</sup> sem C.B.C.S)	C.O.1- It examines to what extent we can find a place for ethics in a naturalistic, scientific picture of the world. C.O.2- We examines various challenges to the realistic view, including challenges from evolutionary theory and neuroscience.
Philosophy of Upanisad ( 5 <sup>th</sup> sem Elective)	C.O.1- We becomes familiar with the greatest tenor of the Upanishads. C.O.2- it help us to understand philosophy not merely an intellectual exercise in India, but also a guiding factor of human life.
philosophy of Gita (5 <sup>th</sup> sem Elective)	C.O.-1 It is indeed the proverbial philosopher stone transforming our lives from being reactive to become effective.
Textual study Isa Upanisad with Samkara Bhasya (5 <sup>th</sup> sem Elective)	C.O.-1 Teach us mantras for divine
philosophy of Language (6 <sup>th</sup> sem Elective)	C.O- 1 Examines vies about the nature of meaning, reference, truth and their relationship
Applied Ethics (6 <sup>th</sup> sem elective)	C.O. – Deals with specific moral problems of fundamental importance for today individual and society.
Skill enhancement (3 <sup>rd</sup> &4 <sup>th</sup> sem C.B.C.S)	C.O.- Teach us about reason and critical aspect of our thought.

### **Programme outcome (major)**

#### **Sem – I PHI –HC -1016 Indian Philosophy**

Indian Philosophy teaches us how to turn human beings to spiritual because Indian philosophy discusses all philosophical speculations of India , ancient and modern , Hindus and Non – Hindus, Theist and Atheists.

#### **Sem- I PHI – HC 1026 Logic I**

Logic teaches us the principles of valid thought, propositions, arguments inferences and testing of syllogistic reasoning's.

#### **Sem - II PHI – HC – 2036 Greek philosophy**

This course is to provide the origin and development of the philosophy on the Greek sphere. Many of the ideas Proposed by Socrates, Plato, Aristotle and others have helped to set the agenda for much of the subsequent development of Western philosophy by introducing the major problem that have come to define it.

### **Sem -II PHI – HC 2046 Logic II**

The fundamental of this course teaches us about the knowledge of Symbolic logic, Modern classification of Propositions, propositional logic, Formal proof of validity and Predicate logic .

### **Sem – III PHI – HC 3056 Western Philosophy ( Descartes to Hegel )**

Western philosophy Provides the knowledge about the Descartes rationalism , Lock's empiricism , Kant's categories and Hegel's Dialectic Method and Absolute Idealisms .

### **Sem – III PHI – HC 3066 Indian philosophy II**

This course concerned with the different views of traditional Indian philosophical school .This paper gives the knowledge of Samkhya's purusa and prakrti ,Nyaya ,Vaisesika and Mimamsa's theory of creation ,pramanas , and Sankara and Ramanuja's God, Brahma and atman.

### **Sem III – PHI-HC- 3076/ Ethics-**

This course discusses nature and scope and utility of ethical philosophy, law of karma, Aristotle's virtue, Bentham utilitarianism, theories of punishment etc.

### **Sem IV – PHI-HC-4086- Contemporary Indian philosophy**

Contemporary Indian philosophy helped students to introduce Gandian philosophy, Sarvapelli Radhakrishnan's intellect and intuitions, Sri Aurobindo's integral yoga and swami Vivekakanand's universal religion.

### **Sem IV – PHI-HC -4016 Political and social philosophy**

This course provides the knowledge about the subject matter of human rights and duties, political ideologies, forms of governments, women empowerment, caste discrimination of Gandhi and Ambedkar.

### **SemV PHI-HC-5116 Analytic philosophy**

It helps students to gain knowledge of G.E Moores refutation of idealism, Bertrand Russell's atomism, early and latter Wittgenstein's picture theory of meaning , verification theory , language game etc.

### **Sem V- PHI-HC-5126- Phenomenology & existentialism-**

phenomenology & existentialism deals with the concept of kierkegaard's subjectivity and truth, Sartre's existence and essence, Heidegger's being- in-the world and Husserl's theory of essence.

### **SemVI – PHI-HC-6136- Philosophy of mind- (western/Indian)**

In the philosophy of mind students will understand the concept of psychology, Cartesian dualism, parallelism, behaviorism and problem of personal identity

## **Sem VI-PHI-HC-6146 Meta Ethics-**

Meta ethics teach us the knowledge about normative ethics, conception of good and right, G.E Moore's naturalistic fallacy, Ayer and Stevenson's ethical and moral concepts and R.M Hare's moral argument.

### **Programme outcome B.A Regular with philosophy**

Sem 1<sup>st</sup> C.B.C.S – DSC1A General philosophy – This course will enhance the knowledge of the students regarding the philosophical thought over the society and politics.

Sem 2<sup>nd</sup> C.B.C.S – DSC1B Indian philosophy- This paper is concern with the different views of traditional Indian philosophical school. it is concern with the orthodox and heterodox school, the theory of causation, liberation, law of karma, epistemology, metaphysics and soul theory.

Sem 3<sup>rd</sup> C.B.S.C- DSC 1C Ethics- This paper introduces ethical principles and concept which will develops moral thinking. It also provides the relation of ethics with sociology and politics and discussed theories of punishment theories .

Sem 4<sup>th</sup> C.B.C.S DSD 1D Logic – Logic is a thinking, planning and implementation tools that describes and diagrammatically represents how a project program.

Sem 5<sup>th</sup> C.B.C.S- DSE 1A Contemporary Indian philosophy- This paper emphasizing on the modern Indian philosophical concepts.

Sem 6<sup>TH</sup> C.B.C.S DSE1B- Philosophy of Religion- This paper should be able to construct an accurately answer major philosophical objections of different kinds of religion.

### **COURSE OUTCOME B.A REGULAR WITH PHILOSOPHY**

C.O.1- Demonstrates understanding of major ethical theories and problems in the western tradition though written and oral discussion

C.O.2 – Assess arguments and philosophical perspectives using critical reasoning.

C.O.3- Express complex thought logically and coherently.

### **A Specific outcome: B.A Philosophy**

Philosophy as the subject which investigates the origin, aim, nature, meaning purpose of human life and the world. The word philosophy derived from the Greek word “philos” and “Sophia”, which means wisdom or knowledge. So, philosophy means love of wisdom or search for truth or pursuit of knowledge for its own sake. The main branches of philosophy are Epistemology, Metaphysics and Axiology. Studying philosophy inculcates in us the habit of thinking, yields, intellectual strengths and a power of a new idea, makes us more decisive, enhances confidence, determines the value for life, yields metaphysical knowledge , gives true freedom to man , can guide the scientific civilization along the right path.

Philosophy is a comprehensive study of the universe as a whole. So philosophy is an essential part of a higher education and associated with religion, intellect, moral, Art& aesthetic and politics etc. It is in this sense philosophy is described as the criticism of life and experience.

After completion of the course students can go for the higher studies and pursuit master course in philosophy. They can further be engage in research activities. A graduate student of philosophy

can further after completion of higher studies prepare for competitive examination. Philosophy background students can also pave the way to get administrative job in APSC and UPSC.

# Department of History

## HISTORY (CHOICE BASED CREDIT SYSTEM-CBCS)

### Programme Outcome

Our college is committed to its students for learning and success. Educational process and outcomes are aimed at transformational learning that support students all round and holistic development. The college has stated Program outcomes, and course outcomes for History programs offered by our institution affiliated to Guwahati University.

Under graduate course in History (Honours and Regular) has an aims to understand the following goals

1. Student will be able to be able to learn a basic narrative of historical events in a specific region of the world.
2. Student can distinguish primary and secondary sources.
3. Understand and evaluate historical ideas, arguments, and points of view.
4. Evaluate interpretations and multiple narratives of the past.
5. Student will be able to assess primary historical evidence.
6. Student will be able to compile a bibliography.
7. Student will acquire knowledge and skill to present clear and convincing arguments, based on critical analysis of diverse historical sources, and effectively communicate his interpretations in written or oral form.
8. Students will be able to develop a research question and complete a well-supported piece of historical writing.

### Course Outcome: History (Choice Based Credit System-CBCS)

#### Semester I

#### **HIS-HC-1016: HISTORY OF INDIA-**

After the completion of this paper, the students will be able to explore and effectively use historical tools in reconstructing the remote past of ancient Indian pre and proto history. The course will also train the students to analyse the various stages of evolution of human cultures and the belief systems in the proto- history period.

#### **HIS-HC-1026 : SOCIAL FORMATIONS AND CULTURAL PATTERNS OF THE ANCIENT WORLD**

After the completion of this paper, the students will be able to explain the processes and stages of the evolution of the variety of cultural pattern throughout antiquarian periods in History. They will be able to relate the connections between the various Bronze Age civilizations in the ancient world as well as development of slave and polis societies in ancient Greece.

#### **SEMESTER II**

## **HIS-HC-2016: HISTORY OF INDIA- II**

On successful completion of this course the students will be able to explain the economic and socio-cultural connections, transitions and stratifications during the ruling houses, empires and the politico-administrative nuances of early Indian History from 300 BCE to 300 CE.

## **HIS-HC-2026 : SOCIAL FORMATIONS AND CULTURAL PATTERNS OF THE MEDIEVAL WORLD**

After the completion of this course, the students will be able to analyse and explain the historical socio-political, administrative and economic patterns of the medieval world. They will be able to describe the emergence, growth and decline of various politico-administrative and economic patterns and the resultant changes therein.

## **SEMESTER III**

### **HIS-HC-3016: HISTORY OF INDIA III (750 -1206)**

The completion of this paper will enable the students to relate and explain the developments in India in its political and economic fields and its relation to the social and cultural patterns therein in the historical time period between c.700 to 1206. They will also be able to analyse India's interaction with another wave of foreign influence and the changes brought in its wake in the period.

### **HIS-HC-3026: RISE OF THE MODERN WEST – I**

On completion of this course, the students will be able to explain the major trends and developments in the Western world between the 14th to the 16th century CE. They will be able to explore and analyse the significant historical shifts and events and the resultant effects on the civilizations of Europe in the period.

### **HIS-HC-3036: HISTORY OF INDIA IV (1206 - 1550)**

After completion of this course students will be able to explain the political and administrative history of medieval period of India from 1206 to 1550 AD. They will also be able to analyse the sources of history, regional variations, social, cultural and economic set up of the period.

## **Semester: IV**

### **HIS-HC-4016 : RISE OF THE MODERN WEST – II**

After the completion of this course, the student will be able to explain the political and intellectual currents in Europe in the Modern Age. They will also be able to relate the circumstances and causal factors of the intellectual and revolutionary currents of both Europe and America at the beginning of the Modern age.

### **HIS-HC-4026 : HISTORY OF INDIA V (1550 - 1605)**

At the completion of this course, the students will be able to analyse the circumstances and historical shifts and foundations of a variety of administrative and political setup in India between c.1550-1605. They will also be able to describe the inter relationships between the economy, culture and religious practices of the period.

### **HIS-HC-4036 : HISTORY OF INDIA VI (1605 - 1750)**



after the completion of this course, the students will be able to explain and reconstruct the linkages of the history of India under the Mughal Rule. As a whole, this course will enable them to relate to the socio-economic and religious orientation of the people of Medieval period in India.

#### **Semester: V**

##### **HIS-HC-5016: History of Modern Europe- I ( 1780-1939)**

After the completion of this course the students will be able to evaluate the historical evolution and political developments that occurred in Europe in the period between 1780 to 1939. They will also be able to critically analyse the evolution of social classes, nation states, evolution of capitalism and nationalist sentiment in Europe. They will also be able to relate to the variety of causes that dragged the world into devastating wars in the intervening period.

##### **HIS-HC-5026 : HISTORY OF INDIA VII (1780 - 1857)**

After the completion of this course, the students will be able to relate the circumstances leading to the consolidation of colonial rule over India and their consequences. They will also be able to explain the orientation of the indigenous population and the masses towards resistance to the colonial exploitation. The course will also enable the students to analyse popular uprisings among the tribal, peasant and common people against the British policies.

#### **Semester: VI**

##### **HIS-HC-6016 : HISTORY OF INDIA VIII (1857 - 1950)**

At the completion of this course, the learners will be able to analyse the course of British colonial exploitation, the social mobilizations during the period between c.1857 to 1950 and also the techniques of Indian resistance to British policies. It will also enable the students to explain the circumstances leading to de-colonization and also the initial period of nation building in India.

##### **HIS-HC-6026: HISTORY OF MODERN EUROPE II (1780 -1939)**

After the completion of this course, the students will be able to analyse the historical developments in Europe between c.1780 to 1939. As the course structure of this paper focuses on the democratic and socialist foundations modern Europe, the students will be able to situate the historical development of working class movements, socialist upsurge and the economic forces of the two wars and the other ideological shifts of Europe in the period

#### **Discipline Specific Elective Courses**

##### **HIS –HE-5016: HISTORY OF ASSAM (UPTO 1228)**

This paper will give a general outline of the history of Assam from the earliest times to the advent of the Ahoms in the 13th century. Upon completion, students will be acquainted with major stages of developments in the political, social and cultural history of Assam during the early time

##### **HIS –HE-5026 : HISTORY OF ASSAM (1228 –1826)**

On completion of this paper, students will be able to identify major stages of developments in the political, social and cultural history of Assam during the medieval times. This paper will enable the student to explain the history of Assam from the 13th century to the occupation of Assam by the English East India Company in the first quarter of the 19th century.

### **HIS –HE-6016 : HISTORY OF ASSAM (1826 – 1947)**

Upon completion of this course, students will be able to describe the period of British rule in Assam after its annexation by the imperialist forces. They will also be able to situate the development of nationalism in Assam and its role in India's freedom struggle. The course would enable the students to analyse the main currents of the political and socio-economic developments in Assam during the colonial period.

### **HIS –HE-6026 : ASSAM SINCE INDEPENDENCE**

Students will be able to assess the aftermath of Partition and other socioeconomic developments in post-independence Assam upon completion of this course. They will also be able to identify the main currents of political and socio-economic development in Assam after India's independence and the causes and impact of various struggles and movements in contemporary Assam.

### **Generic Elective Courses**

### **HIS –HG-1016: HISTORY OF INDIA (FROM THE EARLIEST TIMES UP TO 1206)**

Upon completion of this course, students will be able to explain the emergence of state system in North India, development of imperial state structure and state formation in South India in the early period. They will be able to understand the changes and transformations in polity, economy and society in early India and the linkages developed through contacts with the outside world.

### **HIS –HG-2016 : HISTORY OF INDIA (1206 to 1757)**

Upon completion of this course, students will be able to analyse the political and social developments in India between 1206-1757. Students will be able to explain the formation of different States during this period along with their administrative apparatuses, and the society, economy and culture of India in the 13th to mid-18th century period.

### **HIS –HG-3016 :HISTORY OF INDIA ( 1757 to 1947)**

Upon completion of this course, students will be able to understand the major factors that led to the establishment and consolidation of British rule in India. They will also be able to identify the process of growth of resistance against British colonial rule and the eventual growth of Indian nationalist movement, which ultimately led to the end of the British rule in the country

### **HIS –HG-4016 : SOCIAL AND ECONOMIC HISTORY OF ASSAM**

Upon completion of this course, students will be able to analyse and explain the socio-economic history of Assam including among others the development of caste system, religious beliefs, agriculture and land system, the social organization, trade and commerce, various agricultural regulations, plantation economy, development of modern industries, transport system, education, the emergence of middle class, development of literature and press, and growth of public associations.

## **Skill Enhancement Elective Courses**

### **HIS –SE-3014: Historical Tourism in North East India**

After completing this course, students will be able to explain Tourism in North East India with special reference to the historical monuments, cultural and ecological elements and places of the north east India country as tourist and heritage sites of the nation. They will be able to relate to the growing vocation of tourism as an industry and the applicability of historical knowledge for its growth.

### **HIS –SE-4014: Oral Culture and Oral History**

After this course the students will be able to explain complex interrelationships of structures or events in the context of broader social and cultural framework of societies through ‘public memory’ and use oral history to preserve oral culture and local history. The students will be able to espouse the relevance to the northeastern region of India with its diverse culture and ethnic communities whose history is largely oral. The students will be able to use ‘Public memory’ as a tool and a source not only to write public history but also to explore new knowledge in the humanities, social sciences and even in disciplines like architecture, communication studies, gender studies, English, history, philosophy, political science, religion, and sociology.

## Department of Political Science

### POLITICAL SCIENCE HONOURS (CBCS)

Programme Outcome and Course Outcome

B.A (CBCS) Programme Specific Outcome:

After graduation, the student will be able to---

PSO 1 . Understand the contribution of western political thinkers to political thought.

PSO 2. Acquaint with the basic concept, principles and dynamics of Public Administration.

PSO 3. Familiarize with important theories and issues of International Relation .

PSO 4. Acquaint with diverse political system especially the developed countries including China and Switzerland.

PSO 5. Understand the basic concepts and ideologies of Political science discipline .

PSO 6. Understand the basic concept and issues concerning Human Rights and challenges.

PSO 7. It makes to understand the inter connection between local, State, National, and International politics.

### Course Outcome (Honors)

Course Name	POL-HC-1016 UNDERSTANDING POLITICAL THEORY	Students learn about the idea of political theory, its history and approaches and an assessment of its critical and contemporary trends.
	POL-HC-1026—Governance; Issues and Challenges	Helps to understand the importance of governance in the context of globalized world, environment, administration, development.
	POL—HC—2016—Political Theory –Concepts and Debates	Students are familiarizes with the basic normative concepts of political theories. This course encourages critical and reflective analysis and interpretation of social practices through relevant theories.
	POL-HC-2026—Political process in India.	This course helps in understanding the political process of a society. It also helps students to understand the working of the Indian state,

		paying attention to the contradictory dynamics of modern state power.
	POL-HC-3016— Introduction to Comparative Government and Politics .	Understand different political aspects prevailing in different countries. Have the capacity to compare and analyses political system operating in different countries.
	POL-HC-3026—Perspective on Public Administration .	The students will be able to understand an over view of the discipline and how it is different from private administration. The students learn about major contemporary approaches in public administration.
	POL-HC-3036-Perspective on International relation and World History.	The students are given fundamental clarity about the historical evolution. It provides a fairly comprehensive overview of the major political developments and events starting from 20 <sup>th</sup> century.
	POL—HC-4016— Political Processes and Institution in Comparative Perspective.	Points out the basic features of govt. of UK, USA , Chaina and Switzerland and also specify definition, nature, scope of politics, different approaches to the study of comparative politics. Deals with different political groups and pressure groups.
	POL-HC—4026- Public Policy and Administration in India .	Provide an introduction to the interface between public policy and administration in India. It deals with issues of decentralization, financial management, citizen and administration and social welfare from a non-western perspective.
	POL—HC—4036—Global	It introduces students in the key debates on the meaning and

	Politics.	nature of globalization by addressing its political, social, cultural and technological dimension. The course also offers insights into contemporary global issues such as the proliferation of nuclear weapon, ecological issues, international terrorism and human security.
	POL-HC-5016-Classical Political Philosophy .	This course familiarizes students with the manner in which the political questions were first posed. This is a basic foundation course for students.
	POL—HC—5026—Indian Political Thought --1	This course introduces the element of Indian Political Thought. The course as a whole is meant to provide a sense of in the broad streams of Indian thought while encouraging knowledge of individual thinkers.
	POL—HC—6016—Modern Political Philosophy .	Students will be exposed to the manner in which the questions of politics have been posed in terms that have implications for larger questions of thought and existence.
	POL—HC—6026—Indian political thought --11	This course introduces a wide spun of thinkers and themes that defines the modernity of Indian Political Thought.
	POL SEC 3024 Youth and Nation building	This course guides the students to be nation builders so that they can take initiative to develop the national community through Government programs like NSS, NCC program so that it remains politically stable and viable in the long run.

	POL SEC 4014 Panchayati Raj in practice	Describes the concept of Panchayati Raj and rural development, discusses about the concept of decentralization of power and peoples participation.
	POL DSE 5016 Human Rights	Students will understand the basic concept and issues concerning Human Rights and challenges.
	POL DSE 5046 Select Constitution	Points out the basic features of govt. of UK, USA , China and Switzerland and also specify definition, nature, scope of politics, different approaches to the study of comparative politics. Deals with different political groups and pressure groups.
	POL DSE 6016 Indian Foreign policy in Globalizing world	Discusses the origin and evolution of Indian foreign policy, determinants of Indian foreign policy, no-alignment in India's foreign policies, continuities and changes in Indian foreign policies.
	POL DSE 6036 Women power and politics	Students will learn about the feminist analysis of socio-cultural and institutional basis of women's oppression and how to overcome it.
	POL HG (GENERIC) 1016 Introduction to political theory	Students learn about the idea of political theory, its history and approaches and an assessment of its critical and contemporary trends.
	POL HG (GENERIC)2016 Indian Government and politics	Deals with the Indian administration and cultural, social, political, economic and constitutional environment. Covers a various aspects of union and state administration.

	POL HG (GENERIC) 3016 Comparative Government and politics	Understand different political aspects prevailing in different countries. Have the capacity to compare and analyses political system operating in different countries.
	POL HG (GENERIC) 4016 Introduction to International Relations	The students are given fundamental clarity about the historical evolution. It provides a fairly comprehensive overview of the major political developments and events starting from 20 <sup>th</sup> century.

**Course Outcome (Regular)**

Course Name	POL-RC-1016 Introduction to Political Theory	Students learn about the idea of political theory, its history and approaches and an assessment of its critical and contemporary trends.
	POL RC 2016 Indian Government and Politics	Understand different political aspects prevailing in different countries. Have the capacity to compare and analyses political system operating in different countries.
	POL RC 3016 Comparative Government and Politics	Students learn to compare different Government institutions and organisations prevailing in the country.
	POL SEC 3014 Parliamentary procedures and practices	This course helps students to understand generally accepted rules precedence and practices commonly employed in the governance of deliberative assemblies.
	POL RC 4016 Introduction to International Relations	The students are given fundamental clarity about the historical evolution. It provides a fairly comprehensive overview of the major political developments and events



		starting from 20 <sup>th</sup> century.
	POL SEC 4014 Youth and nation building	This course guides the students to be nation builders so that they can take initiative to develop the national community through Government programs like NSS, NCC program so that it remains politically stable and viable in the long run.
	POL SEC 5014 Panchayati Raj in practice	Describes the concept of Panchayati Raj and rural development, discusses about the concept of decentralization of power and peoples participation.
	POL RE DSE 5016 Public Administration	Provide an introduction to the interface between public policy and administration in India. It deals with issues of decentralization, financial management, citizen and administration and social welfare from a non-western perspective.
	POL RG(GENERIC) 5016 Public Administration	Provide an introduction to the interface between public policy and administration in India. It deals with issues of decentralization, financial management, citizen and administration and social welfare from a non-western perspective.
	POL SEC 6014 Citizens and Rights	Provide an introduction to various rights of citizens.
	POL RE DSE 6016 Public Administration 2	Provide an introduction to the interface between public policy and administration in India. It deals with issues of decentralization, financial management, citizen and administration and social welfare from a non-western

		perspective.
	POL RG (GENERIC) 6016 Public Administration 2	Provide an introduction to the interface between public policy and administration in India. It deals with issues of decentralization, financial management, citizen and administration and social welfare from a non-western perspective.

# Department of Geography

## B.A./B.SC. GEOGRAPHY

### PROGRAMME SPECIFIC OUTCOME

Geography is a spatial science. It includes places, landscape, environment and people. The dynamic relationship between and among them are the main study. It covers natural as well as social sciences. The study of geography is significant to have better appreciation of the Earth surface as our home and have better understanding of its limitations.

**A program in geography provides many transferable skills –**

PO1	Cartographer- academic institution, DC office, Circle Office.
PO2	Commercial Surveyor- Road networking agencies.
PO3	Environmentalist / Environment consultant.
PO4	Geographic information systems officer.
PO5	Town and country planner.
PO6	Planning and development officer.
PO7	Academician.

### Course outcomes B.A. / B.Sc. in Geography-

Paper	Course	Outcome
GGY-HC-1016	Geomorphology	The student will learn that the Earth is unstable and it is undergoing constant changes due to dynamic earth's process.
GGY-HC-1026	Cartographic Techniques	Understanding the importance of various cartographic techniques in geographical study.

GGY-HC-2016	Human Geography	The paper will be useful for students in developing ideas on human environment issues that geographers usually address in anthropocene
GGY-HC-2026	Climatology & Biogeography	The paper will be useful for students in developing ideas on climate related aspects of geographical analysis

GGY-HC-3016	Economic Geography	The paper will develop ideas on how geographical aspects organize economic space & will offer perspectives to students if they wish to pursue a research programme.
-------------	--------------------	---

GGY-HC-3026	Geography of India with special reference to North East-India	Useful for students in developing & understanding on Indian geography and its various dimensions.
GGY-HC-3036	Quantitative methods in Geography	Understanding of the statistical methods and techniques used in geographical studies
GGY-HC-3024	Thematic Cartography	General understanding of preparation of different types of plan and maps

GGY-HC-4016	Environmental Geography and Disaster management	This course will be useful for students in developing ideas on environmental issues that geographers usually address
GGY-HC-4026	Population and Settlement Geography	To understand population and settlement pattern and analyses it spatially
GGY-HC-4036	Remote Sensing Techniques and GIS	This course is useful for students in developing skills in spatial data analysis if they wish to pursue a research programme

GGY-HC-5016	Regional Development and Planning	To understand and developing ideas on disparities within and between countries and their fallout
GGY-HC-5026	Field Techniques in Geography	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
GGY-HG-5016	Climate Change: Vulnerability and Adaptation	The students will acquire knowledge and skill to detect the noticeable impacts of climate change in their vicinity
GGY-HG-5026	Social and Political Geography	Understanding concept of social and political issues of the societies

GGY-HC-6016	Geographical Thought	This course will be useful for students in understanding perspectives on the development and contemporary trends in geography and its systematic study
GGY-HC-6026	Geography of Resources and Development	Understanding of the basic concept of resource and its various types and their utilities
GGY-HE-6016	Geography of Health and Wellbeing	Understanding of the concept of human health in the context of geography of health

GGY-HE-6026	Hydrology Oceanography	and	To learn and analyses hydrology of any area.
-------------	---------------------------	-----	--

## **(B. SC. (H) PHYSICS)**

### **COURSE OUTCOMES**

#### **CORE COURSES**

##### **CC-I: Mathematical Physics-I (32221101)**

After completing this course, student will be able to

- ❖ draw and interpret graphs of various functions,
- ❖ Solve first and second order differential equations and apply these to physics problems,
- ❖ Understand the concept of gradient of scalar field and divergence and curl of vector fields,
- ❖ Perform line, surface and volume integration and apply Green's, Stokes' and Gauss's Theorems to compute these integrals,
- ❖ Apply curvilinear coordinates to problems with spherical and cylindrical symmetries,
- ❖ Understand elementary probability theory and the properties of discrete and continuous distribution functions.

In the laboratory course, the students will be able to

- ❖ design, code and test simple programs in C++ in the process of solving various problems.

##### **CC-II: Mechanics (32221102)**

Upon completion of this course, students are expected to

- ❖ Understand laws of motion and their application to various dynamical situations,
- ❖ Learn the concept of inertial reference frames and Galilean transformations.
- ❖ The concept of conservation of energy, momentum, angular momentum and apply them to basic problems.
- ❖ Understand translational and rotational dynamics of a system of particles,
- ❖ Apply Kepler's laws to describe the motion of planets and satellite in circular orbit,
- ❖ Understand concept of Geosynchronous orbits,
- ❖ Explain the phenomenon of simple harmonic motion,
- ❖ Understand special theory of relativity - special relativistic effects and their effects on the mass and energy of a moving object.

In the laboratory course, the student shall perform experiments related to mechanics compound pendulum, rotational dynamics (Flywheel), elastic properties (Young Modulus and Modulus of Rigidity), fluid dynamics, estimation of random errors in the observations etc.

##### **CC-III: Electricity and Magnetism (32221201)**

At the end of this course the student will be able to

- ❖ demonstrate the application of Coulomb's law for the electric field, and also apply it to systems of point charges as well as line, surface, and volume distributions of charges.
- ❖ Demonstrate an understanding of the relation between electric field and potential, exploit the potential to solve a variety of problems, and relate it to the potential energy of a charge distribution.
- ❖ Apply Gauss's law of electrostatics to solve a variety of problems,
- ❖ Calculate the magnetic forces that act on moving charges and the magnetic fields due to currents (Biot- Savart and Ampere laws),
- ❖ Understand the concepts of induction and self-induction, to solve problems using Faraday's and Lenz's laws.
- ❖ Understand the basics of electrical circuits and analyze circuits using Network Theorems.

In the laboratory course the student will get an opportunity to

- ❖ verify network theorems and study different circuits such as RC circuit, LCR circuit.
- ❖ Also, different methods to measure low and high resistance, capacitance, self-inductance, mutual inductance, strength of a magnetic field and its variation in space will be learnt.

#### **CC-IV: Waves and Optics (32221202)**

On successfully completing the requirements of this course, the students will have the skill and knowledge to

- ❖ Understand Simple harmonic oscillation and superposition principle,
- ❖ Understand different types of waves and their velocities, Plane, Spherical, Transverse, Longitudinal.
- ❖ Understand Concept of normal modes in transverse and longitudinal waves: their frequencies and configurations.
- ❖ Understand Interference as superposition of waves from coherent sources derived from same parent source.
- ❖ Demonstrate basic concepts of Diffraction: Superposition of wavelets diffracted from aperture, understand Fraunhofer and Fresnel Diffraction.

In the laboratory course, student will gain

- ❖ hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc.
- ❖ Resolving power of optical equipment can be learnt first hand.
- ❖ The motion of coupled oscillators, study of Lissajous figures and behavior of transverse, longitudinal waves can be learnt in this laboratory course.

### **CC-V: Mathematical Physics-II (32221301)**

On successfully completing this course, the students will be able to

- ❖ Represent a periodic function by a sum of harmonics using Fourier series and their applications in physical problems such as vibrating strings etc.
- ❖ Obtain power series solution of differential equation of second order with variable coefficient using Frobenius method.
- ❖ Understand properties and applications of special functions like Legendre polynomials, Bessel functions and their differential equations and apply these to various physical problems such as in quantum mechanics.
- ❖ Learn about gamma and beta functions and their applications.
- ❖ Solve linear partial differential equations of second order with separation of variable method.

In the laboratory course, the students will learn

- ❖ the basics of the Scilab software/Python interpreter and apply appropriate numerical method to solve selected physics problems both using user defined and inbuilt functions from Scilab/Python.
- ❖ They will also learn to generate and plot Legendre polynomials and Bessel functions and verify their recurrence relation.

### **CC-VI: Thermal Physics (32221302)**

At the end of the course, students will be able to

- ❖ Comprehend the basic concepts of thermodynamics, the first and the second law of thermodynamics,
- ❖ Understand the concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations,
- ❖ Know about reversible and Irreversible processes, Learn about Maxwell's relations and use them for solving many problems in Thermodynamics,
- ❖ Understand the concept and behavior of ideal and real gases,
- ❖ Learn the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law, equipartition of energies, mean free path of molecular collisions, viscosity, thermal conductivity, diffusion and Brownian motion.

In the laboratory course, the students are expected to do some basic experiments in thermal Physics, viz., determination of Mechanical Equivalent of Heat (J), coefficient of thermal conductivity of good and bad conductor, temperature coefficient of resistance, variation of



thermo-emf of a thermocouple with temperature difference at its two junctions and calibration of a thermocouple.

### **CC-VII: Digital Systems and Applications (32221303)**

- ❖ This course lays the foundation for understanding the digital logic circuits and their use in combinational and sequential logic circuit design.
- ❖ It also imparts information about the basic architecture, memory and input/output organization in a microprocessor system.
- ❖ The students also learn the working of CRO.
- ❖ Course learning begins with the basic understanding of active and passive components.
- ❖ It then builds the concept of Integrated Chips (IC): its classification and uses. Differentiating the Analog and Digital circuits, the concepts of number systems like Binary, BCD, Octal and hexadecimal are developed to elaborate and focus on the digital systems. Sequential Circuits: Basic memory elements Flips-Flops, shift registers and 4-bits counters leading to the concept of RAM, ROM and memory organization. Timer circuits using IC 555 providing clock pulses to sequential circuits and develop multivibrators.
- ❖ Introduces to basic architecture of processing in an Intel 8085 microprocessor and to Assembly Language. Also impart understanding of working of CRO and its usage in measurements of voltage, current, frequency and phase measurement.

In the laboratory students will learn to construct both combinational and sequential circuits by employing NAND as building blocks and demonstrate Adders, Subtractors, Shift Registers, and multivibrators using 555 ICs. They are also expected to use  $\mu P$  8085 to demonstrate the same simple programme using assembly language and execute the programme using a  $\mu P$  kit.

### **CC-VIII: Mathematical Physics III (32221401)**

After completing this course, student will be able to

- ❖ Determine continuity, differentiability and analyticity of a complex function, find the derivative of a function and understand the properties of elementary complex functions.
- ❖ Work with multi-valued functions (logarithmic, complex power, inverse trigonometric function) and determine branches of these functions
- ❖ Evaluate a contour integral using parametrization, fundamental theorem of calculus and Cauchy's integral formula,
- ❖ Find the Taylor series of a function and determine its radius of convergence,
- ❖ Determine the Laurent series expansion of a function in different regions, find the residues and use the residue theory to evaluate a contour integral and real integral.
- ❖ Understand the properties of Fourier and Laplace transforms and use these to solve boundary value problems.

In the laboratory course, the students will learn the basics of the Scilab software/Python interpreter and apply appropriate numerical method to solve selected physics problems both using user defined and inbuilt functions from Scilab/Python.

### **CC-IX: Elements of Modern Physics (32221402)**

After getting exposure to this course, the following topics would be learnt :

- ❖ Main aspects of the inadequacies of classical mechanics as well as understanding of the historical development of quantum mechanics.
- ❖ Formulation of Schrodinger equation and the idea of probability interpretation associated with wave-functions.
- ❖ The spontaneous and stimulated emission of radiation, optical pumping and population inversion.
- ❖ Three level and four level lasers. Ruby laser and He-Ne laser in details. Basic lasing
- ❖ The properties of nuclei like density, size, binding energy, nuclear forces and structure of atomic nucleus, liquid drop model and nuclear shell model and mass formula.
- ❖ Decay rates and lifetime of radioactive decays like alpha, beta, gamma decay. Neutrino, its properties and its role in theory of beta decay.
- ❖ Fission and fusion: Nuclear processes to produce nuclear energy in nuclear reactor and stellar energy in stars.

In the laboratory course, the students will get opportunity to

- ❖ measure Planck's constant, verify photoelectric effect, determine  $e/m$  of electron, Ionization potential of atoms, study emission and absorption line spectra.
- ❖ They will also find wavelength of Laser sources by single and Double slit experiment, wavelength and angular spread of He-Ne Laser using plane diffraction grating.

### **CC-X: Analog Systems and Applications (32221403)**

At the end of this course, the following concepts will be learnt

- ❖ Characteristics and working of pn junction,
- ❖ Two terminal devices: Rectifier diodes, Zener diode, photodiode etc. NPN and PNP transistors
- ❖ Characteristics of different configurations, biasing, stabilization and their applications. CE and two stage RC coupled transistor amplifier using h-parameter model of the transistor.
- ❖ Designing of different types of oscillators and their stabilities. Ideal and practical op-amps: Characteristics and applications.

In the laboratory course, the students will be able to

- ❖ study characteristics of various diodes and BJT.
- ❖ They will be able to design amplifiers, oscillators and DACs.
- ❖ Also different applications using Op-Amp will be designed.

### **CC-XI: Quantum Mechanics & Applications (32221501)**

The Students will be able to learn the following from this course:

- ❖ Methods to solve time-dependent and time-independent Schrodinger equation, Quantum mechanics of simple harmonic oscillator, Non-relativistic hydrogen atom: spectrum and eigenfunctions,
- ❖ Angular momentum: Orbital angular momentum and spin angular momentum,
- ❖ Bosons and fermions - symmetric and anti-symmetric wave functions, Application to atomic systems.

In the laboratory course, with the exposure in computational programming in the computer lab, the student will be in a position to solve Schrodinger equation for ground state energy and wave functions of various simple quantum mechanical one dimensional and three dimensional potentials.

### **CC-XII: Solid State Physics (32221502)**

On successful completion of the module students should be able to

- ❖ Elucidate the concept of lattice, crystals and symmetry operations.
- ❖ Understand the elementary lattice dynamics and its influence on the properties of materials.
- ❖ Describe the main features of the physics of electrons in solids: origin of energy bands, and their influence electronic behavior.
- ❖ Explain the origin of dia-, para-, and ferro-magnetic properties of solids.
- ❖ Explain the origin of the dielectric properties exhibited by solids and the concept of polarizability.
- ❖ Understand the basics of phase transitions and the preliminary concept and experiments related to superconductivity in solid.

In the laboratory students will carry out experiments based on the theory that they have learned to measure the magnetic susceptibility, dielectric constant, trace hysteresis loop. They will also employ to four probe methods to measure electrical conductivity and the hall set up to determine the hall coefficient of a semiconductor.

### **CC-XIII: Electromagnetic Theory (32221601)**

At the end of this course the student will be able to

- ❖ Apply Maxwell's equations to deduce wave equation, electromagnetic field energy, momentum and angular momentum density.
- ❖ Understand electromagnetic wave propagation in unbounded media: Vacuum, dielectric medium, conducting medium, plasma.
- ❖ Understand electromagnetic wave propagation in bounded media: reflection and transmission coefficients at plane interface in bounded media.
- ❖ Understand polarization of Electromagnetic Waves: Linear, Circular and Elliptical Polarization. Production as well as detection of waves in laboratory. Learn the features of planar optical wave guide.
- ❖ Understand the fundamentals of propagation of electromagnetic waves through optical fibres.

In the laboratory course, the student get an opportunity to perform experiments with Polarimeter, Babinet Compensator, Ultrasonic grating, simple dipole antenna. Also, to study phenomena of interference, refraction, diffraction and polarization.

#### **CC-XIV: Statistical Mechanics**

By the end of the course, students will be able to

- ❖ Understand the concepts of microstate, macrostate, phase space, thermodynamic probability and partition function.
- ❖ Understand the use of Thermodynamic probability and Partition function for calculation of thermodynamic variables for physical system (Ideal gas, finite level system ). Difference between the classical and quantum statistics,
- ❖ Understand the properties and Laws associated with thermal radiation.
- ❖ Apply the Fermi- Dirac distribution to model problems such as electrons in solids and white dwarf stars
- ❖ Apply the Bose-Einstein distribution to model problems such as blackbody radiation and Helium gas.

In the laboratory course, with the exposure in computer programming and computational techniques, the student will be in a position to perform numerical simulations for solving the problems based on Statistical Mechanics.

### **DISCIPLINE SPECIFIC ELECTIVES**

#### **Experimental Techniques(32227501)**

- ❖ Upon successful completion of the course, students will be able to:
- ❖ Learn the measurement systems, errors in measurements and statistical treatment of data.
- ❖ About Noise and signal, signal to noise ratio, different types of noises and their identification.

- ❖ Concept of electromagnetic interference and necessity of grounding.
- ❖ Understand principle of working and industrial applications of various transducers like Electrical, Thermal and Mechanical systems commonly used to measure Temperature and Position in industry. Develop an understanding of construction and working of different measuring instruments.
- ❖ Develop an understanding of construction, working and use of different AC and DC bridges and its applications

### **Advanced Mathematical Physics - I (32227502)**

At the end of this course, students will be able to

- ❖ Understand algebraic structures in n-dimension and basic properties of the linear vector spaces.
- ❖ Represent Linear Transformations as matrices and understand basic properties of matrices.
- ❖ Apply vector spaces and matrices in the quantum world.
- ❖ Learn basic properties of Cartesian and general tensors with physical examples such as moment of inertia tensor, energy momentum tensor, stress tensor, strain tensor etc.
- ❖ Learn how to express the mathematical equations for the Laws of Physics in their covariant forms.

In the laboratory course, the students are expected to solve the problems using the Scilab/C++/Python computer language: Eigenvalues and Eigenvectors of given matrix, determination of wave functions for stationary states as eigenfunctions, eigen energy values of Hermitian differential operators, Lagrangian formulation in classical dynamics etc.

### **Nuclear and Particle Physics(32227504)**

Student to be able to understand

- ❖ The basic properties of nuclei as well as knowledge of experimental determination of the same, the concept of binding energy, its various dependent parameters, N-Z curves and their significance
- ❖ To appreciate the formulations and contrasts between different nuclear models such as Liquid drop model, Fermi gas model and Shell Model and evidences in support.
- ❖ Knowledge of radioactivity and decay laws. A detailed analysis, comparison and energy kinematics of alpha, beta and gamma decays.
- ❖ Familiarization with different types of nuclear reactions, Q- values, compound and direct reactions.
- ❖ To know about energy losses due to ionizing radiations, energy losses of electrons, gamma ray interactions through matter and neutron interaction with matter.

- ❖ Through the section on accelerators students will acquire knowledge about Accelerator facilities in India along with a comparative study of a range of detectors and accelerators which are building blocks of modern day science. It will acquaint students with the nature and magnitude of different forces, particle interactions, families of sub- atomic particles with the different conservation laws, concept of quark model.
- ❖ The acquired knowledge can be applied in the areas of nuclear medicine, medical physics, archaeology, geology and other interdisciplinary fields of Physics and Chemistry. It will enhance the special skills required for these fields.

### **Physics of Devices and Communication (32227505)**

At the end of this course, students will be able to

- ❖ Develop the basic knowledge of semiconductor device physics and electronic circuits along with the practical technological considerations and applications.
- ❖ Understand the operation of devices such as UJT, JFET, MOS, various bias circuits of MOSFET, Charge coupled Devices and Tunnel Diode.
- ❖ Learn to analyze MOSFET circuits and develop an understanding of MOSFET I-V characteristics and the allowed frequency limits.
- ❖ Learn the IC fabrication technology involving the process of diffusion, implantation, oxidation and etching with an emphasis on photolithography and electron-lithography.
- ❖ Apply concepts for the regulation of power supply by developing an understanding of various kinds of RC filters classified on the basis of allowed range of frequencies.
- ❖ Learn basic principles of phase locked loop (PLL) and understand its operation.
- ❖ Gain understanding of Digital Data serial and parallel Communication Standards. Knowledge of USB standards and GPIB.
- ❖ Understand different blocks in communication system, need of modulation, modulation processes and different modulation schemes.

### **Astronomy and Astrophysics (32227506)**

Students completing this course will gain an understanding of

- ❖ Different types of telescopes, diurnal and yearly motion of astronomical objects, and astronomical coordinate systems and their transformations.
- ❖ Brightness scale for stars, types of stars, their structure and evolution on HR diagram.
- ❖ Components of Solar System and its evolution The large scale structure of the Universe and its history
- ❖ Distribution of chemical compounds in the interstellar medium and astrophysical conditions necessary for the emergence and existence of life.

### **Atmospheric Physics (32227507)**

At the end of this course, students will be able to

- ❖ Learn and understand structure of temperature profiles and fine scale features in the troposphere using observations.
- ❖ Understand Atmospheric waves: surface water waves, atmospheric gravity waves, acoustic waves etc
- ❖ Learn remote sensing techniques such as radar, lidar, and satellite to explore atmospheric processes.
- ❖ Understand properties of aerosols, their radiative and health effects.

### **Biological Physics (32227508)**

After completing this course, students will

- ❖ Know basic facts about biological systems, including single cells, multicellular organisms and ecosystems from a quantitative perspective.
- ❖ Gain familiarity with various biological processes at different length and time scales, including molecular processes, organism level processes and evolution.
- ❖ Be able to apply the principles of physics from areas such as mechanics, electricity and magnetism, thermodynamics, statistical mechanics, and dynamical systems to understand certain living processes.
- ❖ Gain a systems level perspective on organisms and appreciate how networks of interactions of many components give rise to complex behavior.
- ❖ Perform mathematical and computational modelling of certain aspects of living systems.

### **Embedded systems - Introduction to Microcontroller (32227518)**

At the end of this course, students will be able to :

- ❖ Know the major components that constitute an embedded system.
- ❖ Understand what is a microcontroller, microcomputer embedded system.
- ❖ Describe the architecture of a 8051 microcontroller.
- ❖ Write simple programs for 8051 microcontroller in C language.
- ❖ Understand key concepts of 8051 microcontroller systems like I/O operations, interrupts, programming of timers and counters. Interface 8051 microcontroller with peripherals
- ❖ Understand and explain concepts and architecture of embedded systems
- ❖ Implement small programs to solve well-defined problems on an embedded platform.
- ❖ Develop familiarity with tools used to develop an embedded environment
- ❖ Learn to use the Arduino Uno (an open source microcontroller board) in simple applications.
- ❖ In the laboratory, students will program 8051 microcontroller and Arduino to perform various experiments

### **Linear Algebra and Tensor Analysis (xxx3)**

At the end of this course, students will be able to

- ❖ Understand algebraic structures in n-dimension and basic properties of the linear vector spaces.
- ❖ Represent Linear Transformations as matrices and understand basic properties of matrices.
- ❖ Apply vector spaces and matrices in the quantum world.
- ❖ Learn basic properties of Cartesian and general tensors with physical examples such as moment of inertia tensor, energy momentum tensor, stress tensor, strain tensor, geometrical applications etc.
- ❖ Learn how to express the mathematical equations for the Laws of Physics in their covariant forms.

### **Nano Materials and Applications(32227612)**

On successful completion of the module students should be able to

- ❖ Explain the difference between nanomaterials and bulk materials and their properties.
- ❖ Explain the role of confinement on the density of state function and so on the various properties exhibited by nanomaterials compared to bulk materials.
- ❖ Explain various methods for the synthesis/growth of nanomaterials including top down and bottom up approaches.
- ❖ Analyze the data obtained from the various characterization techniques
- ❖ Explain the concept of Quasi-particles such as excitons and how they influence the optical properties.
- ❖ Explain the Interger Quantum Hall Effect and the concept of Landau Levels, and edge states in conductance quantization.
- ❖ Explain the conductance quantization in 1D structure and its difference from the 2DEG system.
- ❖ Explain various applications of nano particles, quantum dots, nano wires etc
- ❖ Explain why nanomaterials exhibit properties which are sometimes very opposite, like magnetic, to their bulk counterparts.

In the Lab course students will

- ❖ synthesize nanoparticles by different chemical routes and characterize them in the laboratory using the different techniques, learnt in the theory.
- ❖ They will also carry out thin film preparation and prepare capacitors and evaluate its performance.
- ❖ They will fabricate a PN diode and study its I-V characteristics.



## **Communication System (32227613)**

At the end of this course, students will be able to

- ❖ Understand of fundamentals of electronic communication system and electromagnetic communication spectrum with an idea of frequency allocation for radio communication system in India.
- ❖ Gain an insight on the use of different modulation and demodulation techniques used in analog communication
- ❖ Learn the generation and detection of a signal through pulse and digital modulation techniques and multiplexing.
- ❖ Gain an in-depth understanding of different concepts used in a satellite communication system.
- ❖ Study the concept of Mobile radio propagation, cellular system design and understand mobile technologies like GSM and CDMA.
- ❖ Understand evolution of mobile communication generations 2G, 3G, and 4G with their characteristics and limitations.

In the laboratory course, students will apply the theoretical concepts to gain hands on experience in building modulation and demodulation circuits; Transmitters and Receivers for AM and FM. Also to construct TDM, PAM, PWM, PPM and ASK, PSK and FSK modulator and verify their results.

## **Medical Physics (32227615)**

This course will enable the student to

- ❖ Focus on the application of Physics to clinical medicine.
- ❖ Gain a broad and fundamental understanding of Physics while developing particular expertise in medical applications.
- ❖ Learn about the human body, its anatomy, physiology and BioPhysics, exploring its performance as a physical machine.
- ❖ Learn diagnostic and therapeutic applications like the ECG, Radiation Physics, Xray technology, ultrasound and magnetic resonance imaging.
- ❖ Gain knowledge with reference to working of various diagnostic tools, medical imaging techniques
- ❖ Understand interaction of ionizing radiation with matter - its effects on living organisms and its uses as a therapeutic technique and also radiation safety practices.
- ❖ Gain functional knowledge regarding need for radiological protection and the sources of an approximate level of radiation exposure for treatment purposes.

In the laboratory course, the student will be exposed to the workings of various medical• devices and getting familiarized with various detectors used in medical imaging, medical diagnostics. The hands-on experience will be very useful for the students from job perspective.

### **Applied Dynamics (32227616)**

Upon successful course completion, a student will be able to:

- ❖ Demonstrate understanding of the concepts that underlay the study of dynamical systems.
- ❖ Understand fractals as self-similar structures.
- ❖ Learn various forms of dynamics and different routes to chaos.
- ❖ Understand basic Physics of fluids and its dynamics theoretically and experimentally and by computational simulations

In the Lab course, students will be able to perform Simulations/Lab experiments on coupled Oscillators, Simulation of Simple Population , Predator-Prey Dynamics, Simple genetic circuits, rate equations for some simple chemical reactions, Fractal Formation in Deterministic Fractals, Fluid Flow Models

### **Digital Signal Processing (32227621)**

At the end of this course, students will be able to

- ❖ Learn basic discrete-time signal and system types, convolution sum, impulse and frequency response concepts for linear time-invariant (LTI) systems.
- ❖ Understand use of different transforms and analyze the discrete time signals and systems.
- ❖ Realize the use of LTI filters for filtering different real world signals.
- ❖ The concept of transfer Learn to solve Difference Equations.
- ❖ Develop an ability to analyze DSP systems like linear-phase, FIR, IIR, All-pass, averaging and notch Filter etc.
- ❖ Understand the discrete Fourier transform (DFT) and realize its implementation using FFT techniques.

### **Physics of Earth (32227624)**

At the end of this course student will be able to

- ❖ Have an overview of structure of the earth as well as various dynamical processes occurring on it.
- ❖ Develop an understanding of evolution of the earth.
- ❖ Apply physical principles of elasticity and elastic wave propagation to understand modern global seismology as a probe of the Earth's internal structure.

- ❖ Understand the origin of magnetic field, Geodynamics of earth quakes and the description of seismic sources; a simple but fundamental theory of thermal convection; the distinctive rheological behaviour of the upper mantle and its top.
- ❖ Explore various roles played by water cycle, carbon cycle, nitrogen cycles in maintaining steady state of earth leading to better understanding of the contemporary dilemmas (climate change, bio diversity loss, population growth, etc.) disturbing the Earth In the tutorial section, through literature survey on the various aspects of health of Earth, project work / seminar presentation, the students will be able to appreciate need to 'save' Earth

### **Advanced Mathematical Physics-II (32227625)**

After the successful completion of the course, the students shall be able to

- ❖ Understand variational principle and its applications: Geodesics in two and three dimensions, Euler Lagrange Equation and simple problems in one and two dimensions.
- ❖ Acquire basic concept of Hamiltonian, Hamilton's principle and Hamiltonian equation of motion, Poisson and Lagrange brackets.
- ❖ Learn elementary group theory: definition and properties of groups, subgroups, Homomorphism, isomorphism, normal and conjugate groups, representation of groups, Reducible and Irreducible groups.
- ❖ Learn the theory of probability: Random variables and probability distributions, Expectation values and variance.

### **Classical Dynamics (32227626)**

At the end of this course, students will be able to:

- ❖ Understand the physical principle behind the derivation of Lagrange and Hamilton equations, and the advantages of these formulations.
- ❖ Understand small amplitude oscillations.
- ❖ Understand the intricacies of motion of particle in central force field. Critical thinking and problem-solving skills Recapitulate and learn the special theory of relativity extending to Four – vectors,
- ❖ Learn the basics of fluid dynamics, streamline and turbulent flow, Reynolds's number, coefficient of viscosity and Poiseuille's equation.

### **Dissertation (32227627)**

- ❖ Exposure to research methodology
- ❖ Picking up skills relevant to dissertation project, such as experimental skills in the subject, computational skills, etc.
- ❖ Development of creative ability and intellectual initiative

- ❖ Developing the ability for scientific writing
- ❖ Becoming conversant with ethical practices in acknowledging other sources, avoiding plagiarism, etc.

### **Verilog and FPGA based system design (32227628)**

At the end of this course, students will be able to

- ❖ Understand the steps and processes for design of logic circuits and systems.
- ❖ Differentiate between combinational and sequential circuits.
- ❖ Design various types of state machines.
- ❖ Understand various types of programmable logic building blocks such as CPLDs and FPGAs and their tradeoffs.
- ❖ Write synthesizable Verilog code.
- ❖ Write a Verilog test bench to test various Verilog code modules.
- ❖ Design, program and test logic systems on a programmable logic device (CPLD or FPGA) using Verilog.

### **Advanced Quantum Mechanics (xxx4)**

At the end of this course, students will be able to

- ❖ Learn to represent quantum states by ket vectors, physical observables as operators and their time evolution.
- ❖ Understand commutator brackets between observables and their properties.
- ❖ Learn concept of system of identical non- interacting particles: dynamics of two level systems, qubits.
- ❖ Understand the addition of orbital and spin angular momenta.
- ❖ Gain the basic idea of variational method

## **SKILL-ENHANCEMENT COURSES (SEC)**

### **Physics Workshop Skills (32223901)**

After completing this course, student will be able to :

- ❖ Learning measuring devices like Vernier callipers, Screw gauge, travelling microscope and Sextant for measuring various length scales.
- ❖ Acquire skills in the usage of multimeters, soldering iron, oscilloscopes, power supplies and relays.
- ❖ Developing mechanical skill such as casting, foundry, machining, forming and welding and will become familiar with common machine tools like lathe, shaper, drilling, milling, surface machines and Cutting tools.

- ❖ Getting acquaintance with prime movers: Mechanism, gear system, wheel, Fixing of gears with motor axle. Lever mechanism. Lifting of heavy weight using lever. braking systems, pulleys.

### **Computational Physics Skills (32223902)**

Students will be able to

- ❖ Use computers for solving problems in Physics.
- ❖ Prepare algorithms and flowcharts for solving a problem.
- ❖ Use Linux commands on terminal
- ❖ Use an unformatted editor to write sources codes.
- ❖ Learn “Scientific Word Processing”, in particular, using LaTeX for preparing articles, papers etc. which include mathematical equations, picture and tables.
- ❖ Learn the basic commands of Gnuplot.

### **Electrical circuits and Network Skills (32223903)**

At the end of this course, students will be able to

- ❖ Demonstrate good comprehension of basic principles of electricity including ideas about voltage, current and resistance.
- ❖ Develop the capacity to analyze and evaluate schematics of power efficient electrical circuits while demonstrating insight into tracking of interconnections within elements while identifying current flow and voltage drop.
- ❖ Gain knowledge about generators, transformers and electric motors. The knowledge would include interfacing aspects and consumer defined control of speed and power.
- ❖ Acquire capacity to work theoretically and practically with solid-state devices.
- ❖ Delve into practical aspects related to electrical wiring like various types of conductors and cables, wiring-Star and delta connections, voltage drop and losses.
- ❖ Measure current, voltage, power in DC and AC circuits, acquire proficiency in fabrication of regulated power supply.
- ❖ Develop capacity to identify and suggest types and sizes of solid and stranded cables, conduit lengths, cable trays, splices, crimps, terminal blocks and solder

### **Basic Instrumentation Skills (32223904)**

At the end of this course the students will learn the following: The student is expected to have the necessary working knowledge on accuracy, precision, resolution, range and errors/uncertainty in measurements.

- ❖ Course learning begins with the basic understanding of the measurement and errors in measurement.

- ❖ It then familiarizes about each and every specification of a multimeter, multimeters, multivibrators, rectifiers, amplifiers, oscillators and high voltage probes and their significance with hands on mode.
- ❖ Explanation of the specifications of CRO and their significance.
- ❖ Complete explanation of CRT. Students learn the use of CRO for the measurement of voltage (DC and AC), frequency and time period.
- ❖ Covers the Digital Storage Oscilloscope and its principle of working.
- ❖ Students learn principles of voltage measurement.
- ❖ Students should be able to understand the advantages of electronic voltmeter over conventional multimeter in terms of sensitivity etc. Types of AC millivoltmeter should be covered.
- ❖ Covers the explanation and specifications of Signal and pulse Generators: low frequency signal generator and pulse generator.
- ❖ Students should be familiarized with testing and specifications.
- ❖ Students learn about the working principles and specifications of basic LCR bridge.
- ❖ Hands on ability to use analog and digital instruments like digital multimeter and frequency counter.

### **Renewable Energy and Energy harvesting (32223905)**

At the end of this course, students will be able to achieve the following learning outcomes:

- ❖ Knowledge of various sources of energy for harvesting
- ❖ Understand the need of energy conversion and the various methods of energy storage
- ❖ A good understanding of various renewable energy systems, and its components.
- ❖ Knowledge about renewable energy technologies, different storage technologies, distribution grid, smart grid including sensors, regulation and their control.
- ❖ Design the model for sending the wind energy or solar energy plant.
- ❖ The students will gain hand on experience of: (i) different kinds of alternative energy sources, (ii) conversion of vibration into voltage using piezoelectric materials, (iii) conversion of thermal energy into voltage using thermoelectric modules

### **Engineering Design and Prototyping/Technical Drawing(32223906)**

This course will enable the student to be proficient in:

- ❖ Understanding the concept of a sectional view – visualizing a space after being cut by a plane. How The student will be able to draw and learn proper techniques for drawing an aligned section.
- ❖ Understanding the use of spatial visualization by constructing an orthographic multi view drawing.
- ❖ Drawing simple curves like ellipse, cycloid and spiral, Orthographic projections of points, lines and of solids like cylinders, cones, prisms and pyramids etc.

- ❖ Using Computer Aided Design (CAD) software and AutoCAD techniques

### **Radiation Safety (32223907)**

This course will help students in the following ways:

- ❖ Awareness and understanding the hazards of radiation and the safety measures to guard against these hazards.
- ❖ Learning the basic aspects of the atomic and nuclear Physics, specially the radiations that originate from the atom and the nucleus.
- ❖ Having a comprehensive knowledge about the nature of interaction of matter with radiations like gamma, beta, alpha rays, neutrons etc. and radiation shielding by appropriate materials. K
- ❖ knowing about the units of radiations and their safety limits, the devices to detect and measure radiation.
- ❖ Learning radiation safety management, biological effects of ionizing radiation, operational limits and basics of radiation hazards evaluation and control, radiation protection standards, 'International Commission on Radiological Protection' (ICRP) its principles, justification, optimization, limitation, introduction of safety and risk management of radiation. nuclear waste and disposal management, brief idea about Accelerator driven Sub-Critical System' (ADS) for waste management.
- ❖ Learning about the devices which apply radiations in medical sciences, such as MRI, PET.
- ❖ Understanding and performing experiments like Study the background radiation levels using Radiation detectors, Determination of gamma ray linear and mass absorption coefficient of a given material for radiation shielding application

### **Applied Optics (32223908)**

Students will be able to :

- ❖ Understand basic lasing mechanism qualitatively, types of lasers, characteristics of laser light and its application in developing LED, Holography.
- ❖ Gain concepts of Fourier optics and Fourier transform spectroscopy.
- ❖ Understand basic principle and theory of Holography.
- ❖ Grasp the idea of total internal reflection and learn the characteristics of optical fibers

### **Weather Forecasting (32223909)**

The student will gain the following:

- ❖ Acquire basic knowledge of the elements of the atmosphere, its composition at various heights, variation of pressure and temperature with height.

- ❖ Learn basic techniques to measure temperature and its relation with cyclones and anti-cyclones.
- ❖ Knowledge of simple techniques to measure wind speed and its directions, humidity and rainfall.
- ❖ Understanding of absorption, emission and scattering of radiations in atmosphere; Radiation laws.
- ❖ Knowledge of global wind systems, jet streams, local thunderstorms, tropical cyclones, tornadoes and hurricanes.
- ❖ Knowledge of climate and its classification. Understanding various causes of climate change like global warming, air pollution, aerosols, ozone depletion, acid rain.
- ❖ Develop skills needed for weather forecasting, mathematical simulations, weather forecasting methods, types of weather forecasting, role of satellite observations in weather forecasting, weather maps etc. Uncertainties in predicting weather based on statistical analysis.
- ❖ Develop ability to do weather forecasts using input data.

In the laboratory course, students should be able to learn: Principle of the working of a weather Station, Study of Synoptic charts and weather reports, Processing and analysis of weather data, Reading of Pressure charts, Surface charts, Wind charts and their analysis.

### **Introduction to Physical Computing (xxx1)**

The student will be able to

- ❖ Understand the evolution of the CPU from microprocessor to microcontroller and embedded computers from a historical perspective.
- ❖ Operate basic electronic components and analog and digital electronics building blocks including power supply and batteries.
- ❖ Use basic laboratory equipment for measurement and instrumentation.
- ❖ Understand the Arduino ecosystem and write simple Arduino programs (sketches)
- ❖ Understand sensor characteristics and select a suitable sensor for various applications.
- ❖ Read digital and analog data and produce digital and analog outputs from an embedded computer.
- ❖ Understand how to interface an embedded computer to the physical environment.
- ❖ Visualize the needs of a standalone embedded computer and implement a simple system using Arduino

### **Numerical Analysis (xxx2)**

After completing this course, student will be able to:

- ❖ approximate single and multi-variable function by Taylor's Theorem.
- ❖ Solve first order differential equations and apply it to physics problems.



- ❖ solve linear second order homogeneous and non-homogeneous differential equations with constant coefficients.
- ❖ Calculate partial derivatives of function of several variables
- ❖ Understand the concept of gradient of scalar field and divergence and curl of vector fields. perform line, surface and volume integration Use Green's, Stokes' and Gauss's Theorems to compute integrals.

In Lab, student will be able to design, code and test simple programs in C++ learn Monte Carlo techniques, fit a given data to linear function using method of least squares find roots of a given non-linear function Use above computational techniques to solve physics problems.

## **GENERIC ELECTIVES**

### **Electricity and Magnetism (32225101)**

At the end of this course, students will be able to

- ❖ Gain the concepts of vector analysis.
- ❖ Apply Gauss's law of electrostatics to solve a variety of problems.
- ❖ Articulate knowledge of electric current, resistance and capacitance in terms of electric field and electric potential.
- ❖ Calculate the magnetic forces that act on moving charges and the magnetic fields due to currents (Biot- Savart and Ampere laws)
- ❖ Gain brief idea of dia, para and ferro-magnetic materials ,
- ❖ Understand the concepts of induction and self-induction, to solve problems using Faraday's and Lenz's laws Have an introduction to Maxwell's equations.

In the laboratory course the student will get an opportunity to verify network theorems and study different circuits such as RC circuit, LCR circuit. Also, different methods to measure low and high resistance, capacitance etc.

### **Mathematical Physics (32225102)**

At the end of this course, the students will be able to

- ❖ Find extrema of functions of several variables.
- ❖ Represent a periodic function by a sum of harmonics using Fourier series and their applications in physical problems such as vibrating strings etc..
- ❖ Obtain power series solution of differential equation of second order with variable coefficient using Frobenius method.
- ❖ Understand properties and applications of special functions like Legendre polynomials, Bessel functions and their differential equations and apply these to various physical problems such as in quantum mechanics.
- ❖ Learn about gamma and beta functions and their applications.

- ❖ Solve linear partial differential equations of second order with separation of variable method.
- ❖ Understand the basic concepts of complex analysis and integration.

In the laboratory course, the students will be able to design, code and test simple programs in C++ in the process of solving various problems

### **Digital, Analog and Instrumentation (32225103)**

- ❖ Differentiating the Analog and Digital circuits, the concepts of number systems like Binary, BCD, Octal and hexadecimal are developed to elaborate and focus on the digital systems.
- ❖ Characteristics and working of pn junction.
- ❖ Two terminal devices: Rectifier diodes, Zener diode, photodiode etc
- ❖ NPN and PNP transistors: Characteristics of different configurations, biasing, stabilization and their applications. CE and two stage RC coupled transistor amplifier using h-parameter model of the transistor.
- ❖ Designing of different types of oscillators and their stabilities.
- ❖ Ideal and practical op-amps: Characteristics and applications. Timer circuits using IC 555 providing clock pulses to sequential circuits and develop multivibrators..
- ❖ Also impart understanding of working of CRO and its usage in measurements of voltage, current, frequency and phase measurement.

In the laboratory students will learn to construct both combinational and sequential circuits by employing NAND as building blocks. They will be able to study characteristics of various diodes and BJT. They will also be able to design amplifiers (using BJT and Op-Amp), oscillators and multivibrators. They will also learn working of CRO

### **Applied Dynamics (32225104)**

Upon successful course completion, a student will be able to:

- ❖ Demonstrate understanding of the concepts that underlay the study of dynamical systems.
- ❖ Understand fractals as self-similar structures.
- ❖ Learn various forms of dynamics and different routes to chaos.
- ❖ Understand basic Physics of fluids and its dynamics theoretically and experimentally and by computational simulations

In the Lab course, students will be able to perform Simulations/Lab experiments on coupled Oscillators, Simulation of Simple Population, Predator-Prey Dynamics, Simple genetic circuits, rate equations for some simple chemical reactions, Fractal Formation in Deterministic Fractals, Fluid Flow Models.

### **Medical Physics(32225105)**

This course will enable the student to

- ❖ Focus on the application of Physics to clinical medicine.
- ❖ Gain a broad and fundamental understanding of Physics while developing particular expertise in medical applications.
- ❖ Learn about the human body, its anatomy, physiology and BioPhysics, exploring its performance as a physical machine.
- ❖ Learn diagnostic and therapeutic applications like the ECG, Radiation Physics, X-ray technology, ultrasound and magnetic resonance imaging.
- ❖ Gain knowledge with reference to working of various diagnostic tools, medical imaging techniques
- ❖ Understand interaction of ionizing radiation with matter - its effects on living organisms and its uses as a therapeutic technique and also radiation safety practices.
- ❖ Gain functional knowledge regarding need for radiological protection and the sources of an approximate level of radiation exposure for treatment purposes.

In the laboratory course, the student will be exposed to the workings of various medical devices and getting familiarized with various detectors used in medical imaging, medical diagnostics. The hands-on experience will be very useful for the students from job perspective.

### **Mechanics(3225201)**

Upon completion of this course, students are expected to

- ❖ Understand the role of vectors and coordinate systems in Physics.
- ❖ Learn to solve Ordinary Differential Equations: First order, Second order Differential Equations with constant coefficients.
- ❖ Understand laws of motion and their application to various dynamical situations.
- ❖ Learn the concept of inertial reference frames and Galilean transformations.
- ❖ Also, the concept of conservation of energy, momentum, angular momentum and apply them to basic problems.
- ❖ Understand translational and rotational dynamics of a system of particles. Apply Kepler's laws to describe the motion of planets and satellite in circular orbit.
- ❖ Understand concept of Geosynchronous orbits Explain the phenomenon of simple harmonic motion.
- ❖ Understand special theory of relativity - special relativistic effects and their effects on the mass and energy of a moving object.

In the laboratory course, the student shall perform experiments related to mechanics: compound pendulum, rotational dynamics (Flywheel), elastic properties (Young Modulus and Modulus of Rigidity), fluid dynamics, estimation of random errors in the observations etc.

### **Elements of Modern Physics(3225202)**

After getting exposure to this course, the following topics would be learnt:

- ❖ Main aspects of the inadequacies of classical mechanics as well as understanding of the historical development of quantum mechanics.
- ❖ Formulation of Schrodinger equation and the idea of probability interpretation associated with wave-functions. The spontaneous and stimulated emission of radiation, optical pumping and population inversion. Three level and four level lasers. Ruby laser and He-Ne laser in details. Basic lasing
- ❖ The properties of nuclei like density, size, binding energy, nuclear forces and structure of atomic nucleus, liquid drop model and nuclear shell model and mass formula. Decay rates and lifetime of radioactive decays like alpha, beta, gamma decay.
- ❖ Neutrino, its properties and its role in theory of beta decay.
- ❖ Fission and fusion: Nuclear processes to produce nuclear energy in nuclear reactor and stellar energy in stars.

In the laboratory course, the students will get opportunity to measure Planck's constant, verify photoelectric effect, determine  $e/m$  of electron, Ionization potential of atoms, study emission and absorption line spectra. They will also find wavelength of Laser sources by single and Double slit experiment, wavelength and angular spread of He-Ne Laser using plane diffraction grating.

### **Solid State Physics(32225203)**

On successful completion of the module students should be able to

- ❖ Elucidate the concept of lattice, crystals and symmetry operations.
- ❖ Understand the elementary lattice dynamics and its influence on the properties of materials.
- ❖ Describe the main features of the physics of electrons in solids: origin of energy bands, and their influence electronic behavior.
- ❖ Explain the origin of dia-, para-, and ferro-magnetic properties of solids.
- ❖ Explain the origin of the dielectric properties exhibited by solids and the concept of polarizability.
- ❖ Learn the properties of superconductivity in solid.

In the laboratory students will carry out experiments based on the theory that they have learned to measure the magnetic susceptibility, dielectric constant, trace hysteresis loop. They will also employ to four probe methods to measure electrical conductivity and the hall set up to determine the hall coefficient of a semiconductor.

### **Embedded System: Introduction to Microcontroller (32225204)**

At the end of this course, students will be able to :

- ❖ Know the major components that constitute an embedded system. Understand what is a microcontroller, microcomputer embedded system.
- ❖ Describe the architecture of a 8051 microcontroller. Write simple programs for 8051 microcontroller in C language.
- ❖ Understand key concepts of 8051 microcontroller systems like I/O operations, interrupts, programming of timers and counters.
- ❖ Interface 8051 microcontroller with peripherals
- ❖ Understand and explain concepts and architecture of embedded systems
- ❖ Implement small programs to solve well-defined problems on an embedded platform.
- ❖ Develop familiarity with tools used to develop an embedded environment
- ❖ Learn to use the Arduino Uno (an open source microcontroller board) in simple applications.

In the laboratory, students will program 8051 microcontroller and Arduino to perform various experiments.

### **Biological Physics(32225205)**

After completing this course, students will

- ❖ Know basic facts about biological systems, including single cells, multicellular organisms and ecosystems from a quantitative perspective.
- ❖ Gain familiarity with various biological processes at different length and time scales, including molecular processes, organism level processes and evolution.
- ❖ Be able to apply the principles of physics from areas such as mechanics, electricity and magnetism, thermodynamics, statistical mechanics, and dynamical systems to understand certain living processes.
- ❖ Gain a systems level perspective on organisms and appreciate how networks of interactions of many components give rise to complex behavior.
- ❖ Perform mathematical and computational modelling of certain aspects of living systems.
- ❖ Acquire mastery of the fundamental principles and applications of various branches of Physics in understanding biological systems.
- ❖ Learn relevance of chemistry principles and thermodynamics in understanding energy transfer mechanism and protein folding in biological systems.
- ❖ Get exposure to complexity of life at i) the level of Cell, ii) level of multi cellular organism and iii) at macroscopic system – ecosystem and biosphere Get exposure to models of evolution.

### **Waves and Optics(32225310)**

On successfully completing the requirements of this course, the students will have the skill and knowledge to:

- ❖ Understand Simple harmonic oscillation and superposition principle.
- ❖ Understand different types of waves and their velocities: Plane, Spherical, Transverse, Longitudinal.
- ❖ Understand Concept of normal modes in transverse and longitudinal waves: their frequencies and configurations.
- ❖ Understand Interference as superposition of waves from coherent sources derived from same parent source.
- ❖ Demonstrate basic concepts of Diffraction: Superposition of wavelets diffracted from aperture, understand Fraunhofer and Fresnel Diffraction.

In the laboratory course, student will gain hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc. Resolving power of optical equipment can be learnt first hand. The motion of coupled oscillators, study of Lissajous figures and behaviour of transverse, longitudinal waves can be learnt in this laboratory course.

### **Quantum Mechanics(32225311)**

The Students will be able to learn the following from this course:

- ❖ Methods to solve time-dependent and time-independent Schrodinger equation.
- ❖ Quantum mechanics of simple harmonic oscillator.
- ❖ Non-relativistic hydrogen atom: spectrum and eigenfunctions.
- ❖ Angular momentum: Orbital angular momentum and spin angular momentum.
- ❖ Bosons and fermions - symmetric and anti-symmetric wave functions. Application to atomic systems

In the laboratory course, with the exposure in computational programming in the computer lab, the student will be in a position to solve Schrodinger equation for ground state energy and wave functions of various simple quantum mechanical onedimensional and three dimensional potentials.

### **Communication System (32225312)**

At the end of this course, students will be able to

- ❖ Understand of fundamentals of electronic communication system and electromagnetic communication spectrum with an idea of frequency allocation for radio communication system in India.
- ❖ Gain an insight on the use of different modulation and demodulation techniques used in analog communication
- ❖ Learn the generation and detection of a signal through pulse and digital modulation techniques and multiplexing.

- ❖ Gain an in-depth understanding of different concepts used in a satellite communication system.
- ❖ Study the concept of Mobile radio propagation, cellular system design and understand mobile technologies like GSM and CDMA.
- ❖ Understand evolution of mobile communication generations 2G, 3G, and 4G with their characteristics and limitations.

In the laboratory course, students will apply the theoretical concepts to gain hands on experience in building modulation and demodulation circuits; Transmitters and Receivers for AM and FM. Also to construct TDM, PAM, PWM, PPM and ASK, PSK and FSK modulator and verify their results.

### **Verilog and FPGA based system design (32225313)**

At the end of this course, students will be able to

- ❖ Understand the steps and processes for design of logic circuits and systems.
- ❖ Differentiate between combinational and sequential circuits.
- ❖ Design various types of state machines..
- ❖ Understand various types of programmable logic building blocks such as CPLDs and FPGAs and their tradeoffs.
- ❖ Write synthesizable Verilog code.
- ❖ Write a Verilog test bench to test various Verilog code modules.
- ❖ Design, program and test logic systems on a programmable logic device (CPLD or FPGA) using Verilog.

### **Nano Materials and Applications(32225314)**

On successful completion of the module students should be able to

- ❖ Understand the basic concepts of Quantum Mechanics and solve Schrodinger wave equation for simple problems.
- ❖ Explain the difference between nanomaterials and bulk materials and their properties.
- ❖ Explain the role of confinement on the density of state function and so on the various properties exhibited by nanomaterials compared to bulk materials.
- ❖ Explain various methods for the synthesis/growth of nanomaterials including top down and bottom up approaches.
- ❖ Analyze the data obtained from the various characterization techniques.
- ❖ Explain various applications of nano particles, quantum dots, nano wires etc.
- ❖ Explain why nanomaterials exhibit properties which are sometimes very opposite, like magnetic, to their bulk counterparts.

In the Lab course students will synthesize nanoparticles by different chemical routes and characterize them in the laboratory using the different techniques, learnt in the theory. They will also carry out thin film preparation and prepare capacitors and evaluate its performance. They will fabricate a PN diode and study its I-V characteristics.

### **Thermal Physics and Statistical Mechanics(32225415)**

At the end of this course, students will

- ❖ Learn the basic concepts of thermodynamics, the first and the second law of thermodynamics, the concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations. They are also expected to learn Maxwell's thermodynamic relations.
- ❖ Know the fundamentals of the kinetic theory of gases, Maxwell-Boltzman distribution law, equipartition of energies, mean free path of molecular collisions, viscosity, thermal conductivity, diffusion and Brownian motion.
- ❖ Learn about the black body radiations, Stefan- Boltzmann's law, Rayleigh-Jean's law and Planck's law and their significances.
- ❖ Learn the quantum statistical distributions, viz., the Bose-Einstein statistics and the Fermi-Dirac statistics.

In the laboratory course, the students are expected to: Measure of Planck's constant using black body radiation, determine Stefan's Constant, coefficient of thermal conductivity of a bad conductor and a good conductor, determine the temperature coefficient of resistance, study variation of thermo emf across two junctions of a thermocouple with temperature etc

### **Digital Signal Processing (32225416)**

At the end of this course, students will be able to

- ❖ Learn basic discrete-time signal and system types, convolution sum, impulse and frequency response concepts for linear time-invariant (LTI) systems.
- ❖ Understand use of different transforms and analyze the discrete time signals and systems.
- ❖ Realize the use of LTI filters for filtering different real world signals. The concept of transfer
- ❖ Learn to solve Difference Equations.
- ❖ Develop an ability to analyze DSP systems like linear-phase, FIR, IIR, All-pass, averaging and notch Filter etc.
- ❖ Understand the discrete Fourier transform (DFT) and realize its implementation using FFT techniques.
- ❖ Design and understand different types of digital filters such as finite & infinite impulse response filters for various applications.



In the Lab course, the students will realize various concepts using Scilab simulations like Digital Filters and their classifications based on the response, design and algorithm, Fluency in using Fast Fourier Transform, Signal generation, realization of systems and finding their transfer function, characterization using pole-zero plots and designing digital filters.

### **Nuclear and Particle Physics(32225417)**

- ❖ To be able to understand the basic properties of nuclei as well as knowledge of experimental determination of the same, the concept of binding energy, its various dependent parameters, N-Z curves and their significance
- ❖ To appreciate the formulations and contrasts between different nuclear models such as Liquid drop model, Fermi gas model and Shell Model and evidences in support.
- ❖ Knowledge of radioactivity and decay laws. A detailed analysis, comparison and energy kinematics of alpha, beta and gamma decays.
- ❖ Familiarization with different types of nuclear reactions, Q- values, compound and direct reactions.
- ❖ To know about energy losses due to ionizing radiations, energy losses of electrons, gamma ray interactions through matter and neutron interaction with matter.
- ❖ Through the section on accelerators students will acquire knowledge about Accelerator facilities in India along with a comparative study of a range of detectors and accelerators which are building blocks of modern day science. It will acquaint students with the nature and magnitude of different forces, particle interactions, families of sub- atomic particles with the different conservation laws, concept of quark model.
- ❖ The acquired knowledge can be applied in the areas of nuclear medicine, medical physics, archaeology, geology and other interdisciplinary fields of Physics and Chemistry. It will enhance the special skills required for these fields.

### **Astronomy and Astrophysics(32225418)**

Students completing this course will gain an understanding of

- ❖ Different types of telescopes, diurnal and yearly motion of astronomical objects, and astronomical coordinate systems and their transformations.
- ❖ Brightness scale for stars, types of stars, their structure and evolution on HR diagram. Components of Solar System and its evolution,
- ❖ The large scale structure of the Universe and its history,
- ❖ Distribution of chemical compounds in the interstellar medium and astrophysical conditions necessary for the emergence and existence of life.

### **Atmospheric Physics(32225419)**

At the end of this course, students will be able to:

- ❖ Learn and understand structure of temperature profiles and fine scale features in the troposphere using observations.
- ❖ Understand Atmospheric waves: surface water waves, atmospheric gravity waves, acoustic waves etc
- ❖ Learn remote sensing techniques such as radar, lidar, and satellite to explore atmospheric processes.
- ❖ Understand properties of aerosols, their radiative and health effects.

### **Physics of Earth (32225420)**

At the end of this course student will be able to

- ❖ Have an overview of structure of the earth as well as various dynamical processes occurring on it.
- ❖ Develop an understanding of evolution of the earth.
- ❖ Apply physical principles of elasticity and elastic wave propagation to understand modern global seismology as a probe of the Earth's internal structure.
- ❖ Understand the origin of magnetic field, Geodynamics of earthquakes and the description of seismic sources; a simple but fundamental theory of thermal convection; the distinctive rheological behaviour of the upper mantle and its top.
- ❖ Explore various roles played by water cycle, carbon cycle, nitrogen cycles in maintaining steady state of earth leading to better understanding of the contemporary dilemmas (climate change, bio diversity loss, population growth, etc.) disturbing the Earth
- ❖ In the tutorial section, through literature survey on the various aspects of health of Earth, project work / seminar presentation, the students will be able to appreciate need to 'save' Earth

# Department of Mathematics

## CBCS BA/B.Sc. Mathematics:

### Programme Specific Outcome:

Mathematics is the study of topics such as quantity (number theory), structure (algebra), space (Geometry) and change (analysis). It has no generally accepted definition. It is the science that draws necessary conclusion. It gives us concepts which are essential in the advanced study for all branches of science.

The CBCS course of mathematics is designed in such a way that it gives the students the required basic concepts which will lead to think logically about the day to day activities that mathematics can explain. The course is so flexible that the student can take note and use it for advance work and resource purpose in that field. It also includes projects work which will built research spirit among the students.

After successful completion of this programme, the student will be able to explain the core idea and technique of mathematics, will be able to transmit mathematical ideas, can teach us the real value of mathematics in ground level, will be to investigate and solve unfamiliar maths problem and many more.

### **Course Outcome of CBCS Mathematics:**

Papers	Course Outcomes
1. Algebra and Trigonometry	HC-1026: It gives the basic idea of Groups Relation, Function. HC-3026: Groups and pure mathematics HC-4036: To study the concept of Rings, Ideas HC-6016: Concepts of Matrices, Complex numbers are discussed elaborately.
1. Calculus	HC-1016: Different types of differentiation and its application in real life are discussed and many problems are solved HC-4016: It gives the idea to solve Integration using different methods.
1. Differential Equation	HC-2026: It gives us various methods to solve differential equations and its uses in various fields. HC=6026 Partial Differential Equation
1. Co-ordinate Geometry	HC-3036: It gives us the concept of lines distances, points in both 2-D and 3-D
1. Linear Algebra and Vectors	HC-5026: To Study the vector equation and its uses.

1. Real Analysis	HC-2016: It gives the idea of Pure mathematics such as convergence, limits, sequence, limits, functions etc.
1. Mechanics	HC-5126: To study the mathematical concept about the physical word like centre of Grevity, Moment of Inertial, Force, Fluids etc.
1. Probability	HC-5136: To study the concept of sample space, experiments, expectation, probability distributions and enhance their skills.
1. Optimization	CO1: To study the concept of optimizing the profit, to learn about transportation, assign tasks etc.
1. Spherical Trigonometry & Astronomy	HE-5226: To understand the astronomical processes and systems relating to sun, stars, day, night etc.
1. Number Theory	HC-5116: To study and understand the concept of numbers.
1. Computer Application	HE-5236: To learn to write programming using software's like C++, C etc.
1. Matric Spaces	HC-5016: To Understand the basic concept of metric space, open sphere, closed sphere, normed linear space, metric space etc.
1. Graph Theory	SE-3124: To study the concept of points, lines, its uses in various field and its starting.

# Department of Chemistry

## DEPARTMENT OF CHEMISTRY (CBCS)

### PROGRAMME OUTCOME

#### CORE COURSE

##### SEM-1:

##### **CHE-HC-1014: (INORGANIC CHEMISTRY-I)**

On successful completion, students would have cleared understanding the concept related to atomic and molecular structure, chemical bonding, periodic properties and redox behavior of chemical species. Students will also have hands on experience of standard solution preparation and learn volumetric estimation through acid base and redox reaction.

##### **CHE-HC-1024: (PHYSICAL CHEMISTRY-I)**

In gaseous unit student will learn the kinetic theory of gases, ideal gas and real gases. In liquid state unit, the student are expected to learn the qualitative treatment of the structure of the liquid along with the physical properties of the liquid ,namely- vapour pressure, surface tension and viscosity. In molecular and crystal symmetry unit they will be introduced to the elementary idea of symmetry. In solid state unit the student will learn the basic solid state chemistry application of X-ray crystallography for the determination of some very simple crystal structure. The student will also learn another important topic on ionic equilibria in this course.

##### SEM-2:

##### **CHE-HC-2014: (ORGANIC CHEMISTRY-I)**

Students will be able to identify different classes of organic compounds, their reactivities and mechanism along with stereochemical aspects.

##### **CHE-HC-2024: (PHYSICAL CHEMISTRY-I)**

In this course student will be able to learn laws of thermodynamics, thermochemistry, thermodynamic functions, relations between thermodynamic properties, Gibbs -Helmoltz equation, Maxwell equation etc. Moreover, the students are expected to learn partial molar quantities ,chemical equilibrium ,solution and colligative properties.

##### SEM-3:

##### **CHE-HC-3014: (INORGANIC CHEMISTRY-II)**

On successful completion students would have cleared understanding the concept of principle of redox chemistry in the understanding of metallurgical process. Students will be able to identify the variety of s-block and p-block compound and comprehend their preparation, structure, bonding, properties and uses. Experiments in this course will boost their quantitative estimation skills and introduced the students to preparative methods in inorganic chemistry.

##### **CHE-HC-3024: (ORGANIC CHEMISTRY-II)**

Students are expected to learn classification of organic compounds in terms of their functional groups and their reactivity.

**CHE-HC-3034: (PHYSICAL CHEMISTRY-III)**

The students are expected to learn phase rule AND ITS APPLICATION IN SOME SPECIFIC SYSTEM. They WILL Also learn rate laws of chemical transformation of experimental methods- SSA etc in chemical kinetics unit. Students will also be able to learn surface adsorption processes and the basic of catalysis including enzyme catalysis and acid base catalysis etc.

**SEM-4:**

**CHE-HC-4014: (INORGANIC CHEMISTRY-III)**

On successful completion students would be able naming of co-ordination compounds according to IUPAC. Bonding explanation in this class of compounds understand their various properties in terms of CFSE and predict reactivity.

Through the experiments students not only will be able to prepare, estimate or separate metal complexes and will also be able to design independently.

**CHE-HC-4024: (ORGANIC CHEMISTRY-III)**

Student shall demonstrate the ability to identify the classify different types N- based derivatives alkaloids and heterocyclic compounds and their structure, mechanism and reactivity.

**CHE-HC-4034: (INORGANIC CHEMISTRY-IV)**

In this course students will learn theories of conductance and electrochemistry. Student will understand some very important topics such as solubility products, ionic product etc. they are expected to learn various parts of electrochemical cells along with Faraday's Laws of electrolysis. Students will also gain basic theoretical idea of electrical and magnetic properties of atoms and molecules.

**SEM-5:**

**CHE-HC-5014: (ORGANIC CHEMISTRY-IV)**

Students will be able to explain or describe the important features of nucleic acids , amino acids, enzymes and develop their ability to examine their properties and applications.

**CHE-HC-5024: (PHYSICAL CHEMISTRY-V)**

After completion of this course the students are expected to understand the application of the quantum mechanics in some chemical system such as hydrogen atom or hydrogen like ions. They will be able to understand the basics of various kinds of spectroscopic technique and photochemistry.

**SEM-6:**

**CHE-HC-6014: (INORGANIC CHEMISTRY-IV)**

By studying this course the students will be expected to learn about ligands substitution and redox reactions take place in co- ordination complexes. Students will also learn about organometallic

compounds, their bonding, stability, reactivity and uses. They will be familiar with the variety of catalyst based on transition metals and their application in industry. Students will also be able to appreciate the use of concept like solubility product, common ion effect, pH etc.

With the experiments related to co-ordination compounds synthesis calculation of 10Dq, controlling factor etc will make the students appreciate the concepts of theory in experiments

#### **CHE-HC-6024: (ORGANIC CHEMISTRY-V)**

Students will able to explain the basic principle of different spectroscopic techniques and their importance in chemical analysis. Students will able to classify or critically examine carbohydrates, polymer, and dye materials.

#### **CHEMISTRY- Discipline Specific Electives(DSE)**

##### **SEM-5:**

#### **CHE-HE-5014: (APPLICATIONS OF COMPUTER IN CHEMISTRY)**

After the completion it will help the students to interpret the laboratory data, curve fitting of experimental work also perform quantum mechanical calculations for various molecular models.

#### **CHE-HE-5024: ( ANALYTICAL METHODS IN CHEMISTRY)**

On successful completion students will have theoretical understanding about choice of various analytical techniques qualitative and quantitative characterization of samples. At the same time through the experiments students will gain hands on experience on the discussed techniques.

#### **CHE-HE-5034: (MOLECULAR MODELLING AND DRUG DESIGN)**

Students will able to identify basic components of computer and programming as applied to computer assisted design and modeling of molecules.

#### **CHE-HE-5044: (NOVEL INORGANIC SOLIDS)**

After the completion, students will also opt for studying an interdisciplinary Masters programme with an emphasis on the synthesis and applications of various materials or take up of job in material production and processing industry.

#### **CHE-HE-5054: (POLYMER CHEMISTRY-IV)**

Students will learn the definition and classification of polymer, kinetics of polymerization, molecular weight of polymer, glass transition temperature etc. They also learn preparation structure and properties of some industrially important polymers.

#### **CHE-HE-5064: (INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS)**

Students will able to explain the theoretical basic of different analytical techniques and compare the result thereof.

#### **CHEMISTRY- Discipline Specific Electives(DSE)**

##### **SEM-6:**

#### **CHE-HE-6046: (RESERCH METHODOLOGY FOR CHEMISTRY)**

They will be able to construct a rational research proposal to generate fruitful output in terms of publications and patents in the field of chemical science.

**CHE-HE-6014: (GREEN CHEMISTRY)**

Apart from introducing the principles of green chemistry, this course will make them conversant with applications of green chemistry to organic synthesis.

**CHE-HE-6024: (INDUSTRIAL CHEMICALS AND ENVIRONMENT)**

Students will get to know about industrial metallurgy and energy generation industry. They also learn about the industrial waste management, their safe disposal and the importance of environmental friendly, "green chemistry" in chemical industry.

**CHE-HE-6034: (INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE)**

This course will establish the foundation of industrial inorganic chemistry among the students.

**SKILL ENHANCEMENT:**

**SEM-3:**

**CHE-SE-3024: (IT SKILLS FOR CHEMISTS)**

It focus on skill development related to basic computer operation and information technology.

**CHE-SE-3034: (BASIC ANALYTICAL CHEMISTRY)**

Upon completion they shall be able to explain the basic principle of chemical analysis and analysed data following scientific methodology.

**CHE-SE-3044: (CHEMICAL TECHNOLOGY AND SOCIETY)**

They will be familiarized with the processes and terminology in chemical industry.

**CHE-SE-3054: (CHEMOINFORMATICS)**

Students would be able to explain, interpret and examine the utility of computer and software tools in solving chemistry related problems.

**CHE-SE-3064: (BUSINESS SKILL FOR CHEMISTS)**

Students shall be able to explain and analyze the important steps of business operations, finance, and intellectual property as applied to chemical industry.

**CHE-SE-3074: (INTELLECTUAL PROPERTY RIGHT [IPR] )**

After completion they will have depth understanding about the importance and types of IPR.

**SEM-4:**

**CHE-SE-4014: (ANALYTICAL CLINICAL BIOCHEMISTRY)**

Students will able to identify various molecules relevant to particular pathological condition and their protocols.

**CHE-SE-4024: (GREEN METHODS IN CHEMISTRY)**



They will be able to describe and evaluate chemical products and processes from environmental perspective.

**CHE-SE-4034: (PHARAMACEUTICAL CHEMISTRY)**

They will be able to drug development process.

**CHE-SE-4044: (CHEMISTRY OF COSMETICS AND PERFUME)**

They will learn about the preparation and chemistry involved with the production of different cosmetic

**CHE-SE-4054: ( PESTICIDE CHEMISTRY)**

Student will be able to explain or describe and critically examine different types of pesticides,their activity and toxicity.

**CHE-SE-4064: (FUEL CHEMISTRY)**

They will learn about the classes of renewable and non- renewable sources and about the composition of coal and crude petroleum etc.

# **Department of Botany**

## **BSc (BOTANY)**

### **PROGRAMME OUTCOME:**

Students having Botany as major or general subject, gain knowledge of the nature around them. They become familiar with the diverse range of plants and their interactions with all other living beings including man. Since only the green plants have the capacity of synthesizing starch, the ultimate source of food material for all living beings, it is necessary for all to understand the importance of plants for the existence of life in the earth. The theoretical and practical knowledge of the plant sciences make the students aware of the utilization of plants and their products for human welfare and environment conservation. They also become more attached with the nature and understand the role played by the different plant groups in maintaining ecological balances.

Students opting for botany as a subject, get tremendous scope for higher studies in Botany, Agriculture, Horticulture, Forestry, Biotechnology, pharmacognosy, Virology and Bacteriology, Bioinformatics and so on. They can progress further in their careers and work as research scholars and scientists(in institute of natural and international repute), teachers, nutritionists, environmentalists, taxonomists, microbiologists, pharmacists, food technologists etc. they can also find employment in public sectors like- forensic study, Food Companies, Biological Supply Houses, Drug companies, Laboratory technicians etc. In government sector, students can get job in National Parks and wildlife Services, Social forestry and Environmental Protection, Plant Genetic Resources Lab, Forest Service etc.

### **PROGRAMME SPECIFIC OUTCOME:**

1. Understand the significance of plants in the living world, their diversity and conservation.
2. Acquire knowledge of pure and applied botany.
3. Understand the contribution of plants and their products in different fields covering food and nutrition, medicine, textile, oil, fibre etc.
4. Learn the basic concepts of environment and its relation to the living world.
5. Familiarizing with the distribution of plants in various phytogeographical regions at local, national and international levels.
6. Acquiring ideas about the origin and evolution of life on earth including the concepts of variation, adaptation, survival, natural selection, isolation and speciation.
7. Correlation of different tools and techniques for better understanding of different life processes.
8. Innovation of new methods of bringing improvement in meeting the food requirements of the growing world.
9. Learning recent trends of advance cytogenetics, informatics, biotechnology, molecularbiology, microbiology, physiology and plant biochemistry for improving knowledge and research skills in the students.

## COURSE OUTCOMES

### **B.Sc. BOTANY**

#### **B.Sc. SEMESTER I :**

##### **Paper M 101 (Theory) : Plant kingdom, Algae & Fungi :**

1. Understanding the diversity, forms, life span and ecological status of plant kingdom.
2. Knowing the diversity, morphology, life cycle patterns and economic importance of algae.
3. Learning the diversity in different groups of fungi.
4. Having knowledge of general characters, nutrition, reproduction and economic importance of fungi.
5. Knowledge of various forms of virus bacteria and Lichens.

##### **Paper M 102(Theory): Bryophytes and Pteridophytes :**

1. Knowing the diversity and phylogenetic relationships among the various groups of bryophytes.
2. Learning the morphology, anatomy and reproduction and economic importance of bryophytes.
3. Knowledge of classification and comparative study of morphology and reproduction in pteridophytes.
4. Understanding heterospory and seed habit in different types in pteridophytes.

##### **Paper M103 (Practical):**

1. Firsthand knowledge and study of the morphological and reproductive structure of algae, fungi, bryophytes and pteridophytes through diagrams, illustrations and slide preparations.
2. Identifying various forms of bacteria, virus and lichens from photographs/slides/specimens.

#### **B.Sc. SEMESTER II :**

##### **Paper M201 (Theory) : Gymnosperms, Paleobotany& Plant Anatomy :**

1. Understanding the floras of the past geological era and the internal structure and organization of the plants belonging to gymnosperms.
2. Knowing the comparative morphology, anatomy and reproduction of various types of gymnosperms.
3. Understanding the process of fossilization and knowing about the types of fossils.
4. Knowing about the internal structure and organization of the plants for anatomical studies.

##### **Paper M202 (Theory) : Cell Biology and Plant Biotechnology :**

1. Understanding the various aspects of cell and its components

2. Knowledge about the basis of genetical studies.
3. Understanding the basic principle of bio-chemistry.
4. Knowing the classification, nomenclatures and properties of enzymes.

**Paper M 203(Practical):**

1. Getting practical knowledge and ideas about the various types of gymnosperms and paleobotanical specimens.
2. Be able to prepare slides of various specimens studied.
3. Getting the knowledge of continuity of life and growth patterns by study and slide preparation of the cell division.

**B.Sc. SEMESTER III :**

**Paper M301 (Theory) : Ecology, Plant Geography and Evolution :**

1. Understanding various aspects of ecology and environment.
2. Knowing in detail about various ecosystems and their characteristics.
3. Learning the characteristics of population and community.
4. Being aware in dealing with various measure of controlling pollution in the environment.
5. Knowledge of different phytogeographical regions of India with respect to the vegetation of the different regions locally and globally.
6. Analyzing the mysteries surrounding origin of life on earth, evolution mechanisms and gene frequencies with respect to population.

**Paper M302 (Theory) : Instrumentation & Laboratory Techniques :**

1. This paper helps the students to understand instrumentation including microscopy, microtechniques, chromatography and laboratory techniques.
2. Use of camera lucida, hot air oven, incubators, aultoclave, laminar air flow, centrifuge, ph meter etc.
3. The uses, principles and advantages of different methods of chromatography (Paper, TLC and column)
4. Demonstration of different types of instruments like spectrophotometer and their uses.
5. Basic principles of fixatives, stains, field museum and herbarium specimens and their preservation techniques.

**Paper M303 (Practical):**

Hands on experience obtained during the practical classes helps the students to understand the inter-relationship between the different components of the ecosysytem. Students also learn to handle the instruments efficiency in their place of work, and laboratories.

**B.Sc. SEMESTER IV :**

**Paper 401(Morphology, Palynology, Embryology of Angiosperms) :**

1. Understanding angiosperms with relation to their origin and evolution, floral morphology and role of advanced morphology in plant classification.
2. Familiarizing the aspects and prospects of palynology and methods of studying pollen morphology, production and sterility.
3. Learning the basics of embryology, types of embryosacs and evolutionary significance.

#### **Paper M 402 : Plant taxonomy :**

1. Learning the objectives, principles and evolutionary trends in taxonomy.
2. Familiarizing with the plant classification systems, concepts of species, genus and family, nomenclature, modern trends in plant taxonomy.
3. Having knowledge of different families of dicotyledons and monocotyledons.

#### **Paper M403 : (Practical)**

Practical study of the pollen morphology has proved to be of great value in fields of taxonomy, forensic science and classification of plants.

#### **B.Sc. SEMESTER V :**

#### **Paper M 501 (Theory): Microbiology and Immunology**

This paper makes the students learn and understand the role of microorganisms in our daily life, the studies on immunology and general characteristics of virus, bacteria alongwith their importance.

#### **Paper M 502(Theory): Plant Pathology and lichen**

This paper deals with the different aspects of plant pathology including plant diseases, symptoms and control measure and plant disease management.

The study of lichens help in understanding pollution and lichens as a pollution indicator.

#### **Paper M 503 (Theory): Cytogenetics, Plant Breeding and Biometrics**

The students learning the basic concepts in cytology and genetics of both plants and animals. The knowledge of plant breeding can let the students dealing with genetic improvements of crops. The knowledge of biostatistics helps the students in various field of biology and statistical methodology, analytical research in genetics, plant breeding and other disciplines of life sciences.

#### **Paper M 504 (Theory): Applied Botany**

The study of this paper makes the students familiar with the knowledge on utilization of plants and microorganisms for human welfare. The students become aware of environmental aspects like differentiation and climate change. The application of breeding techniques and various methods of plant propagation are known to the course students.

#### **Paper M 505 (Practical): Microbiology, Plant Pathology and Lichens**

This paper includes the study and firsthand knowledge of

1. Gram staining of bacteria.
2. Preparation and sterilization of culture media.
3. Isolations of soil microorganisms, air microbes and fungal pathogens.
4. Pure culture techniques.
5. Counting of bacterial cells.
6. Thallus morphology of various lichens.

**Paper M 506 (Practical): Cytogenetics, Plant breeding, Biometrics and applied Botany**

1. Learn the practical aspects of karyotypes study, chromosomal aberrations, gene interactions and process of emasculation for plant breeding
2. Learn the calculation methods of mean, median, mode, standard deviation and stand error.
3. Knowledge of isolation of bacteria from root nodules and counting of pollen grains in honey samples.

**B.Sc. SEMESTER VI :**

**Paper M 601 (Theory): Molecular Biology and Plant Biochemistry**

1. The study of this paper enhances the knowledge of gene, genetic code, properties and evidences.
2. Learn thoroughly about DNA, RNA, exons, introns, transcription and translation in prokaryotes.
3. Knowledge of mutation and its types.
4. Understanding the biochemical processes of nitrogen metabolism, protein synthesis, enzymes and carbohydrate metabolism.

**Paper M 602 (Theory): Bioinformatics, Computer Application and Biotechnology**

1. Get a basic information of bioinformatics and its applications.
2. Basic knowledge of computer in biological sciences.
3. Enable to learn the history, scope and significance of biotechnology.
4. Having a detailed knowledge of plant tissue culture and plant genetic engineering.

**Paper M 603 (Theory): Plant Physiology**

This paper gives a thorough knowledge of the concepts and importance of plant physiology with the study of –

1. Plant soil water relationship.
2. Mineral nutrition and salt absorption.
3. Photosynthesis as a whole process.
4. Respiration in plants.
5. Translocation of organic solutes.
6. Growth and development.

**Paper M 604 (Theory): Plant Resource Utilization**

The paper enables the students to understand the concept of plant resource utilization and sustainable use of plant resources. The paper includes the study of

- a. Origin of cultivated plants.
- b. Beverages
- c. Fibres
- d. Timber and non timber plant resources.
- e. Pharmacognosy and its importance in medicinal plant uses.
- f. Ethnobotany and intellectual property rights.

**Paper M 605(Practical):**

1. This practical paper helps the students to have hands on training on methods of protein estimation, separation and identification of amino acids presents in plant extracts, sugar estimation, paper chromatography, TAN estimation and nitrogen estimation.
2. Knowledge and practices of preparing slant, knowledge of micro propagation, genetic engineering techniques, construction of restriction map, study of different bio fertilizers, aseptic seed germination, study of different bio fertilizers and homology modeling through the BLAST.
3. Understanding the practical utility of bioinformatics in preparing databases, sequence alignment, homology and phylogenetic tree.
4. Utility of computer applicxations.

**Paper M 606 (Practical):**

1. This practical paper includes the study of various physiological experiments and processes related to plasmolysis, water potential, transpiration, imbibitions, respiration and chromatography.
2. The students are also acquainted with the chemical tests for tannins, pharmacognosial studies and histochemical tests.

# **Department of Zoology**

## **B.Sc. (ZOOLOGY)**

### **Programme Outcome:**

Students graduating with a degree in Zoology have a wide scope in different fields. Apart from pursuing for higher studies (master in the subject with specialization in different branches in Zoology), the student can choose from a variety of related branches of science like

- .Paramedical fields, health sciences,
- .Agricultural sciences,
- .Masters in forestry,
- .Wildlife officers,
- .Marine biologists,
- .Food technology and processing,
- .Psychology,
- .Mass media and communication,
- . Entrepreneurship in poultry, Sericulture, Apiculture, Pisciculture, apiary, dairy etc.

### **Program Specific Outcomes:**

#### **B.Sc. (ZOOLOGY)**

Student learns about the scientific classification, biosystematics, taxonomy and animal diversity. Students learn about different animals and their anatomical parts.

Students understand animal diversity including ecology and wildlife conservation and management. They get an idea of osteology as well as environmental biology.

Students recognized the relationship between structure and functions at different levels of biological organization (e.g., molecules, cells, organs, organisms, populations, and species) for the major groups of animals.

Students also learn about embryology and genetics. They also learn about preparation of embryological slides.

Student understands about physiology of animals, biochemistry involved in various body functions, about immunology, and practically learns biochemical techniques.

In the last semester students understands animal behavior, their evolution and adaptation to various environments. They are acquainted with practical aspect applied biological sciences or economic Zoology such as sericulture, Apiculture, aquaculture, rDNA technology and medicine for their career opportunities.

#### **1<sup>st</sup> Semester (Major)**

#### **Paper M-101: Biosystematics and taxonomy**



## **Outcome**

- Student is able to understand the fundamental principles of systematic in which the animals are classified according to their characters.
- The theories to be followed for classification are also studied.

## **Paper 102: Animal diversity (Non chordates)**

### **Outcome**

- Different groups of invertebrate animals are studied in this course including Protozoa, Porifera, Coelenterate, Platyhelminthes, Aschelminthes, Annelida, Arthropod, Mollusca and Echinodermata.
- General characters and classification up to order are studied.
- Some special features, organs, pathogenicity, life history and significance are studied here.

## **Paper 103: Practical**

### **Outcome**

- Dissections of different systems of invertebrate animals are studied such as leech, cockroaches, pila, prawn etc.
- Temporary slides are prepared from different organs to study the details of their structures prepared by students.
- Prepared slides are studied in this part to understand the structures and arrangement of different muscular regions.
- Study of museum specimens:- The specimens are identified and classified for practical knowledge.

## **2<sup>nd</sup> Semester (Major)**

### **Paper 201: Animal diversity (chordates)**

#### **Outcome**

- Different groups of vertebrate animals are studied in this course including Protochordata, Hemichordata, Urochordata, Cephalochordata, Agnathostomata, Pisces, Amphibia, Reptilia, Aves and Mammalia.
- General characters and classification upto order are studied. Some special features, organs, pathogenicity, life history and significance are studied.

### **Paper – 202: Ecology, Wildlife conservation and Management**

#### **Outcome.**

- Imparts knowledge to the student regarding various aspects of ecology, types of ecosystem, population and community characteristics and dynamics
- Gains knowledge in the areas of wildlife, biodiversity conservation and management

- Gains understanding of wildlife, biodiversity and conservation Biology

### **Paper 203: Practical**

#### **Outcome**

- Dissections of different systems of vertebrate animals are studied.
- Temporary slides are prepared from different organs to study the details of their structures.
- Prepared slides are studied to understand the structures and arrangement of different muscular regions.
- Study of museum specimens:- The specimens are identified and classified for practical knowledge.
- Bones and different types of skull of birds are studied.
- Gains knowledge about environmental biology through the practical of estimation of DO in Water, CO<sub>2</sub>, PH etc

### **3<sup>rd</sup> Semester (Major)**

#### **Paper 301: Comparative Anatomy and Histology**

#### **Outcome**

- In this segment the student learns about comparative structures of heart, and different systems of animals which give them a definite idea not only the structure but also the structural development of that organ and how they become modified according to their need and environment.
- Students learn about differentiation and organization of cells and maintenance of tissues. It helps to get a better idea about their structure and function.
- Study of different dye and stains help the student to get a practical knowledge of handling the tissues for microtomy studies. It helps them for laboratory preparations and expertise in laboratory techniques.

#### **Paper 302: Cell biology**

#### **Outcome**

- Students get awareness about the size, shape and structure and function of cells and different cell organelles.
- This helps the students for a better understanding of cell and its cycle.

#### **Practical 303:**

#### **Outcome**

- Higher knowledge of practical applications of cellular components is studied.

### **4<sup>th</sup> Semester major**

### **Paper: M-401 Developmental Biology**

#### **Outcome:**

- Student's gain Basic concepts of developmental biology, its aim and scope,
- Developmental processes of different animals such as Frogs, Chick embryo studied.

### **Paper: M-402 Genetics**

#### **Outcome:**

- Students gain Knowledge about genetics, back cross and test cross, varieties of gene expressions.
- Students gain understanding about Linkage, Linkage map, Crossing over etc.
- Students learn about the concept behind genetic disorder, gene mutations- various causes associated with inborn errors of metabolism
- Students learn about genetic disorder, gene mutations and sex determination, Human genome etc.
- Understanding of genetic basis of evolution, human karyotyping and speciation.

### **Paper: M-403 (Practical)**

#### **Outcome:**

- Students learn about the development of frog through prepared slides.
- Students gain practical knowledge about the whole mount preparation of chick embryos development which helps a student for a laboratory technician course.
- Gain understanding about the meiosis and mitosis stages of cell division, sex chromatin.

### **TDC Semester 5<sup>th</sup> (Major)**

#### **Paper 501: Animal physiology**

##### **Outcome**

- Students learn about various physiological functions of the body.
- It includes nutrition, Respiration, Circulation, body fluids, excretion, nerve physiology etc in which all structure, function, process and control are to be studied.

#### **Paper 502: Biochemistry and bioenergetics**

##### **Outcome**

- All the biochemical components of the body system are studied.
- It helps the student to get an idea about the chemical compositions of different chemical compounds such as enzymes, hormones and their secretions.
- It also includes the pathway and chemicals which are responsible for the energy production in our body.

### **Paper 503: Endocrinology and immunology**

#### **Outcome**

- Students learn about the endocrine glands and their secretions.
- Students gain knowledge about hormones, their functional activity and regulations.
- Another part includes immunology which deals with a system of defence by some internal secretions antibody antigen reaction.

### **Paper 504: Biological techniques and biostatistics**

#### **Outcome**

- Biological studies need some equipments for analysis of different functions.
- In this chapter students understand about the quantitative and qualitative results.
- Students learn about the Statistics used in biology, their parameters, various methods of determination and its analysis.

### **Paper 505: Practical Physiology**

#### **Outcome**

- The syllabus covers the practical knowledge about blood and its analysis which helps a student for a laboratory technician course.

### **Paper 506: Biochemistry and Endocrinology**

#### **Outcome**

- The syllabus covers the practical knowledge about various biochemical tests and its analysis which helps a student for a laboratory technician course.
- Students also gain knowledge about Dissections and histological studies of different endocrine glands.

### **6<sup>th</sup> semester major**

#### **Paper- M: 601 Animal Behaviour**

##### **Outcome:**

- Understand Animal behaviour and response of animals to different instincts
- Understand about knowledge of Ethology, behavioural equipments, behavioural patterns etc.
- Imparts the knowledge about developmental processes of different animals along with teratology.
- Gains knowledge in the areas of animal behavior and socio-biology.

#### **Paper-M: 602 Evolution and Adaptation.**

##### **Outcome:**

- Explain how life might have originated on this planet
- Use cladistic analysis to better understand and explain the phylogenetic relatedness among organisms.
- Describe Darwin's theories and how the principles of natural selection can lead to speciation.
- Contrast alternate models for macroevolution and describe the major patterns in the fossil record.
- Relate broad patterns in the fossil record to major geological events and plate tectonic movement.
- Explain why organisms succeed best in their own natural environments.
- Explain the theory of evolution by natural selection which provides a model to describe adaptation takes place.

### **Paper –M: 603 Economic Zoology**

#### **Outcome:**

- Understands processes of fisheries, sericulture, apiculture, Lac culture along with crop pest management techniques..
- Gives knowledge of silk worm rearing, mulberry cultivation, pests and diseases associated with silk worm, mulberry and various process involved in silk production.
- It is an agro based cottage industry in India that enables them to get self-employment
- Sericulture is a comprehensive subject that gives in depth knowledge of the study of silkworms both physiological as well as commercial purposes including the various processes involved in the formation of silk.
- Students gain knowledge about various systems study of silkworms and cocoons, other defective cocoons
- Reeling and significant diseases seen in the silkworms
- Students feel confident in teaching Sericulture as well as executing research projects
- Aqua culture systems, induced breeding techniques, post harvesting techniques
- Also gain knowledge about pest, their types, control of pest etc.
- Understand basic concepts about pesticides and their Hazards.
- Helps students for entrepreneurship.

### **Paper: M- 604 Biotechnology, Bioinformatics and Computer applications**

#### **Outcome:**

- Imparts the Knowledge to culture animal cells in artificial media.
- Knowledge of animal cells in culture, growth of cell lines
- Understanding of basic concepts of cell culture media preparation and cell harvesting system.
- Students gain skills in basics of computers, operating systems, overview of programming languages
- Application of internet and statistical bioinformatics in research.

### **Paper M-605(Practical)**

**Outcome:**

- Students gain practical knowledge about identification of different varieties of silkworms.
- Students gain knowledge about identification of various commercially important fishes.
- Imparts practical Knowledge of slide preparation of different parts of honeybee.

**Paper M-606(Practical)****Outcome:**

Students gain knowledge about

- Make research proposal.
- Construct tool of data collection.
- Learn fieldwork modalities.
- Understand the process of data analysis.
- Writing research report