B.Sc. Zoology
Programme Specific Outcomes (PSO)

The B.Sc. Zoology programme is a specialized study of the various aspects of animal life. The study includes animal systematics, anatomy and physiology, developmental biology, genetics and evolution, behaviour and animal distribution. The programme will enable students to opt for careers in areas such as ecology, conservation biology and broad area of research.

PSO1	Inculcating students with requisite domain knowledge, skills and right attitude necessary for the effective understanding of Zoology.
PSO2	Elucidating principles of animal systematics and biodiversity and developing an understanding of the morphology and anatomy of representatives of different animal groups.
PSO3	Elucidating biological principles involved in the study of functional anatomy, biochemistry, genetics, cell and molecular biology, ecology and environmental studies, developmental biology, basic biotechnology, and behaviour in animals.
PSO4	Developing an understanding of the application of animal science to apiculture, pisciculture, sericulture and insect pest management.
PSO5	Developing sound laboratory and safety practices used in animal sciences.
PSO6	Acquisition of skills related to animal identification and the experimental techniques in physiology, cell and molecular biology, genetics and cytogenetics, biochemistry and immunology, field ecology and developmental biology.
PSO7	Developing basic analytical skills and scientific communication skills.

Course Outcomes (COs) in BSc Zoology, SAC

Paper 1A: Systematics, Animal Diversity and Evolution (Theory)

1A1	Learning the scientific concept of animal systematics.
1A2	Knowing the classification of animal phyla and the representatives of each phylum in the animal kingdom.
1A3	Understanding the concept of origin of life and evolution of man.
IA4	Understanding the principles and theories of evolution.

Paper 1B: Systematics, Animal Diversity and Evolution (Practical)

1B1	Acquiring skills in the dissection of anatomical systems of select organisms.
1B2	Acquiring skills in permanent slide preparation.
1B3	Learning the skeletal system of mammals.
1B4	Learning the histology of invertebrate and vertebrate tissues through microscopic sections.

1B5 Learning and understanding the representatives of non-chordates and chordates through museum specimens.

Paper 2A: Cell Biology and Genetics (Theory)

2A1 Acquiring knowledge on structure and functions of cells and their organelles.

2A2 Learning about the cell cycle and cell divisions.

2A3 Understanding the basics of cancer.

2A4 Acquiring knowledge about the components and functions of the immune system.

2A5 Learning Mendelian and Non-Mendelian principles of inheritance.

2A6 Understanding sex determination and chromosomal aberrations.

Paper 2B: Cell Biology and Genetics (Practical)

2B1 Learning the identification of cell organelles and chromosome types.

2B2 Acquiring skills in preparation of mitotic, meiotic stages and polytene chromosomes.

2B3 Understanding phenotypic variations in a population.

Paper 3A: Animal Physiology, Endocrinology and Biochemistry (Theory)

3A1 Learning the physiology of digestion and absorption; respiration and circulation in vertebrates.

3A2 Learning the characteristics and functions of vitamins.

3A3 Learning the ultrastructure and functions of skeletal muscle, urinary and nervous systems in vertebrates.

3A4 Understanding the structure and function of major endocrine glands in mammals, and neuroendocrine system in insects.

3A5 Acquiring knowledge of the classification and functions of different biological molecules.

3A6 Understanding the organisation and functions of biochemical pathways.

3A7 Understanding enzymes and their mechanism of action.

3A8 Learning the structure and functions of nucleic acids.

Paper 3B: Animal Physiology, Endocrinology and Biochemistry (Practical)

3B1 Acquiring skills in the preparation of haemin crystals and estimating the clotting time of human blood.

3B2 Acquiring skills in estimating the amount of oxygen consumed by fishes.

3B3 Learning the histology of different endocrine glands through microscopic sections.

3B4 Acquiring skills in detecting carbohydrates, lipids and proteins from different biological samples.

3B5 Acquiring skills in the estimation of ascorbic acid.

Paper 4A: Developmental Biology, Ecology and Economic Zoology (Theory)

4A1 Acquiring knowledge on the basic concepts of developmental Biology.

4A2 Learning the processes of pre- and post-embryonic development in organisms.

4A3 Understanding on the various aspects of Ecology.

4A4 Learning on the structure and functions of ecosystems.

4A5 Acquiring knowledge on resource management and environmental pollution.

4A6 Understanding different aspects of pisciculture, apiculture and integrated pest management.

Paper 4B: Developmental Biology, Ecology and Economic Zoology (Practical)

4B1 Learning the anatomical features of developmental stages through microscopic slides.

4B2 Acquire knowledge of non-chordate larval forms.

4B3 Acquiring skills in water analysis.

4B4 Ability to identify fish species, castes and stages of economically important organisms.

Paper 5A: Functional Anatomy, Zoogeography and Adaptations (Theory)

5A1 Learning the functional anatomy of animal representatives from Invertebrate Phyla.

5A2 Understanding the anatomical features and affinities of animal representatives of the Phylum Chordata.

5A3 Understand the concepts of Zoogeography and Zoogeographical realms.

5A4 Understanding the patterns and regulations of animal behaviour.

5A5 Understanding adaptation of animals in different habitats.

Paper 5B: Functional Anatomy, Zoogeography and Adaptations (Practical)

5B1 Acquiring skills in dissection of functional organ systems.

5B2 Acquiring skills in preparation of permanent mounts.

5B3 Ability to identify vertebrate tissue sections and whole mounts of invertebrates through microscopic slides.

5B4 Understanding adaptive modifications in birds through charts and models.

Paper 6A: Cell and Molecular Biology, and Genetics (Theory)

6A1 Acquiring knowledge about viral, prokaryotic and eukaryotic genomes.

6A2 Understanding the concept of a gene and gene expression.

6A3 Understanding DNA mutation and repair.

6A4 Attaining knowledge about human karyotype, genetic disorders and sex determination in humans.

6A4 Understanding the characteristics and functions of the humoral and cell-mediated immunity.

6A5 Understanding the working principles and applications of biological techniques.

Paper 6B: Cell and Molecular Biology, and Genetics (Practical)

6B1 Proficiency in the working principle and acquiring skills of paper chromatography.

6B2 Understanding in-vitro antigen-antibody reaction and gel electrophoresis.

6B3 Acquiring skills in nucleic acid estimation, meiotic analysis and karyotyping techniques.

Paper 7A: Biochemistry, Animal Physiology and Endocrinology (Theory)

7A1 Understanding the chemical foundations of physiology and enzyme kinetics.

7A2 Understanding the structure and classification of carbohydrates and proteins.

7A3 Understanding the functions and significance of various biochemical pathways.

7A4 Learning the structural components and regulation of physiological processes.

7A5 Elucidating the structure and function of the endocrine system in animals.

7A6 Understanding reproductive cycles and roles of hormones in reproduction of mammals.

7A7 Understanding the principle and process of IVF and embryo transfer technology.

Paper 7B: Biochemistry, Animal Physiology and Endocrinology (Practical)

7B1 Acquiring skills on WBC, RBC counts and estimation of haemoglobin concentration in blood.

7B2 Acquiring skills on estimation of glucose and protein concentration.

7B3 Acquiring skills in dissection and display of endocrine systems.

7B5 Acquiring skills in microtomy.

Paper 8A: Developmental Biology, Environmental Biology and Biotechnology (Theory)

8A1 Learning processes of development (cleavage, morphogenetic movements, gastrulation and organogenesis).

8A2 Learning types of placenta in mammals; principles of regeneration in organisms, teratogenesis and ageing.

8A3 Learning the components of different biomes and ecosystems.

8A4 Understanding different biogeochemical cycles.

8A5 Understanding Ecological succession.

8A6 Understanding environmental pollution, anthropogenic activities and conservation of natural resources.

8A7 Learning the techniques and tools used in Biotechnology.

Paper 8B: Developmental Biology, Environmental Biology and Biotechnology (Practical)

8B1 Acquiring skills to prepare permanent mounts of chick embryo.

8B2 Acquiring skills in understanding regeneration.

8B3 Learning development of chick by observing different stages from microscopic slides.

8B4 Acquiring skills in understanding structure and function of a community using quadrat.

8B5 Acquiring skills in qualitative and quantitative analysis of plankton.

8B6 Acquiring experiential learning through exposure trips.

Department Profile:

1. Name of the Department: History

2. Introduction to the Department:

The Department of History was established on 5th January 1934. This was one of the pioneer courses that the college had started when it was first established.

As far as the Academic aspect is concerned, the syllabus for the Under-graduate course in History Honours is designed and developed by the Affiliating University. The syllabus intends to acquaint the students with knowledge on World, Indian and North East India History and also the basic concepts in history through the paper on Historiography.

The study of History at the Degree Level opens the floodgates of knowledge and opportunities in various fields such as Archaeology, Anthropology, Art and Architecture, Folkloristic, Musicology, etc. Moreover, North East India has not been well presented and incorporated within the mainstream Indian History but the UGC has made an attempt to include North East India within the mainstream of Indian historical studies. St. Anthony's College being located in North East India can, therefore, provide ample scope and opportunities for research in the region's history. Besides, history is a dynamic and ever-changing subject of study and investigation. With the emergence of new sub-disciplines such as Environmental History, Military History, Food History, etc., within History as a subject, students are provided with greater opportunities for specializations.

Besides the above, the completion of a Bachelor Degree in History helps students to compete in various competitive exams both at the state and national levels. Above all, employment opportunities also exist in different departments such as the Department of Art and Culture, Archives, Tourism and the like.

Programme Specific Outcome:

His-UG-101: Ancient India – Familiarizing students with the broad socio-economic and political developments in the Indian Subcontinent from the Harappan Civilization till the 13th century A.D.

Course Outcome:

His-UG-101: Ancient India

01. Understanding the historical and geographical background of the growth and development of Indian civilization
02. Students will be able to analyze and evaluate historical information from multiple sources.
03. Students will have a better understanding of the ancient civilizations of the Indian sub-continent (Harappa and Vedic) and the changing material cultures that led to the further advancement and development of society, polity, religion and culture.
04. Students will be able to examine, analyze and illustrate the various factors that led to the emergence of big kingdoms and empires in India, the assimilation of foreign cultures (Greek, Shaka, Huns, etc.) within the fabric of Indian society and culture.
05. Students will be able to grasp and explain the rich and diverse socio-cultural and politico-religious heritage of India.
06. Students will be able to analyze the administrative systems of Kingdoms and empires of ancient India.

Programme Specific Outcome:

His-UG-202: Medieval India – This course offers an overview of the main trends and developments in India during the medieval period.

Course Outcome:

His-UG-202: Medieval India

01. Students will be able to analyze and understand the political invasion of India by foreign rulers and the subsequent assimilation of these foreign cultures within the Indian culture.
02. Students will learn about the impacts and effects of Muslim rule in India and how it contributed to furthering the development of Indian civilization.
03. Students will be able to comprehend the administrative systems of the Muslim rulers and the various policies that developed during this period.
04. Students will be able to examine and learn about the growth and development of numerous religious movements (Sufism & Bhaktism) in India during the Medieval period.
05. Students will be able to analyze and illustrate the various factors leading to the decline and downfall of the Muslim rules in India.

Programme Specific Outcome:

His-UG-303: History of Modern India – Introducing the students to the main trends and developments in India from the 18th to the 20th century (1757-1947).

Course Outcome:

His-UG-303: History of Modern India

01. Students will be able to formulate basis of modern India through different concept like modernity, Equality, Rule of Law, etc.

02. Students will be able to analyze the process of the rise of modern India and its foundation made by social reformers and freedom fighters.

03. Students will be able to analyze the social background of Indian Nationalism including the rise and growth of Economic nationalism.

04. Students will be able to analyze the impacts of British rule in India

05. Students will learn about the process of the Struggle for Independence and the subsequent partition of Indian into India and Pakistan.

Programme Specific Outcome:

His-UG-404: Historiography – The course content of this paper is to introduce the students to the basic concepts that go to make up the subject matter of history.

Course Outcome:

His-UG-404: Historiography

01. Students will be able to categorize between different school of thoughts and their influence in the process of writing history.

02. Students will learn about the meaning and purpose of history and its relationship with various other disciplines.

03. Students will study the development of different schools of historical thoughts in India and their impact in the development of subsequent historical literature in the country.

04. Students will be able to develop a critical analysis of historical sources as well as the methods of writing history.

Programme Specific Outcome:

His-UG-505: Modern World (Mid-15th Century to World War II) – This course aims at introducing students to some of the major developments in the modern world from the mid-15th century to World War II.

Course Outcome:

His-UG-505: Modern World (Mid-15th Century to World War II)

01. Students will learn about European cultures including the various factors (Renaissance, Scientific Revolution, and Industrial Revolution) that shaped its socio-cultural and political development.

02. Students will be able to examine the various factors that led to the growth and development of nationalism in Europe and its impactful influence in the creation of modern states of Italy and Germany.

03. Students will be able to evaluate the causes and consequences of the rise of dictatorship in Europe (Mussolini in Italy, Hitler in Germany, and General Francisco Franco in Spain)

04. Students will be able to examine the factors that led to the rise of communism in the Soviet Union (modern day Russia) and its consequent impact on the world.

05. Students will be able to understand and illustrate the causes and consequences of the Two World Wars.

Programme Specific Outcome:

His-UG-506: Contemporary World (1945-1991) – To introduce the students to the major political, social, economic and scientific developments in the contemporary world and their resultant effects.

Course Outcome:

His-UG-506: Contemporary World (1945-1991)

01. Students will be able to illustrate the reasons that led to the development of an International Body (the United Nations Organization) dedicated for the maintenance of peace and security in the world.

02. Students will learn about the Cold War as well as develop an understanding of the various causes that led to its development.

03. Students will be able to analyze and understand the technological development and advancement following the Second World War.

04. Students will learn about international relations among nations during the period of the Cold War and the factors that led to the formation of numerous International Bodies (NATO, Warsaw Pact, OPEC, NAM, etc.).

05. Students will be able to analyze the process of decolonization and its impact on international relations.

06. Students will develop an understanding regarding the growth and development of various movements, especially the rise of Feminist Movement and its impact in the world.

Programme Specific Outcome:

His-UG-607 (1): China and Japan (1839-1949) – To introduce the students with the beginning and growth of modernisation in China and Japan during the period 1839-1949.

Course Outcome:

His-UG-607 (1): China and Japan (1839-1949)

01. This course will help students learn about the society and culture of China and Japan and the European expansion in the region.

02. Students will learn about the impact of European expansion in China and Japan and the latter's response to it leading to the growth of modernization.

03. Students will have a proper understanding about the birth of Republic of China as well as the origin and growth of the Communist Party in China leading to the establishment of Communist Rule in the country.

04. Students will also be able to develop better knowledge regarding the modernization of Japan leading to its subsequent rise as a super power in Asia.

05. Students will be able to examine and analyze the role of Japan in Asia and the world as well as its involvement in the Second World War.

Programme Specific Outcome:

His-UG-608 (2): North East India (1824-1972) – To familiarize the students with the major trends of the political, social and economic developments in North East India from 1824 to 1972.

Course Outcome:

His-UG-608 (2): North East India (1824-1972)

01. This course will familiarize students with the process of British expansion and consolidation of its rule in North East India.
02. Students will be able to provide an account of the annexation of various regional kingdoms (Assam, Manipur, Jaintia, Tripura, etc.) by the British.
03. Students will learn about the social and economic changes in the region as a consequent of the establishment of British rule.
04. Students will develop a proper understanding about the relationship between the British and the various tribes of the region as well as their struggle for freedom, and their participation in the freedom struggle of the mainland India.
05. Students will come to know more about the political development after India's attainment of freedom from British rule as well as the process of the attainment of statehood by various states within the Federation of India.

2.6.1. *Teachers and students are aware of the stated Programme and course outcomes of the Programmes offered by the institution.*

Describe Course Outcomes (COs) for all courses and mechanism of communication within a minimum of 500 characters and maximum of 500 words

MASS COMMUNICATIN AND VIDEO PRODUCTION

MCVP-101 Introduction to Mass Communication

This paper aims at introducing the students to the basics of what is communication and how this communication gets expanded through mass media and practically applied to theater.

MCVP-102 ENGLISH LITERATURE AND COMMUNICATION

This paper aims to guide students how to write effectively, read and think analytically and speak confidently. The paper introduces students to various texts, challenges them with writing and speech exercises to broaden not only their vocabulary, but also their creative worldview.

MCVP-201 VISUAL COMMUNICATION

The aim of this paper is to enable the students to ideate, conceptualize and communicate in terms of images.

MCVP-202 MEDIA SCRIPT WRITING

The student will learn the basic fundamentals of script writing, including concept, pitch, proposal, format, techniques, analysis, organization, workflow, and presentation for both fiction and nonfiction category.

MCVP-203 Media Scene in India

This paper will familiarize the students with this vibrant media scene in India.

MCVP-301 MEDIA LAW AND ETHICS

This course will cover the fundamental principles of mass media laws and ethics for journalist to follow in India.

MCVP-302 INTRODUCTION TO PHOTOGRAPHY

This is a basic course in photography, introducing the students to photographic techniques. Apart from learning the history of photography, the students will also be learning digital photography hands-on. By the end of the semester, the students will acquire an understanding of the basic principles of composition, how to use digital cameras, raster/image manipulation software, digital image capture, using a digital camera and varying methods of output.

MCVP-401 VIDEO TECHNOLOGY

The paper aims at teaching the students from the history to the current methods and developments about moving pictures and the science and technology behind it, in producing products for both film and television.

MCVP-402 STUDIO PRODUCTION

[redacted] *This syllabus is a study of basic television production as it applies to live studio programming.*

- **MCVP-403 - ENGLISH LITERATURE AND COMMUNICATION**

[redacted] *This paper aims to equip students with in-depth technical and creative skills in writing. This paper also integrates speech by introducing the art of story-telling which aims to integrate their reading and writing processes with their communicative abilities.*

MCVP-501 AUDIOGRAPHY: DESIGN AND PRODUCTION

[redacted] *This course introduces students to the audio chain, necessary to design and produce audio programmes. Students will learn the various techniques of digital recording that will be suited for studio, television, film or live productions.*

MCVP-502 Film Studies

Objective: This paper aims at giving the student a holistic approach in understanding films by deconstructing this language and helps them to appreciate films better.

MCVP-601 Filmmaking

[redacted] *This Filmmaking paper will give students an opportunity to learn about the different techniques and processes that go into making a professional movie. Students will learn about the key jobs within a film crew, and explore the details and techniques related to each job through interactive assignments and projects. This course culminates in a final film project, which will apply the techniques learned throughout the course.*

MCVP-602 Media Entrepreneurship & Marketing

[redacted] *The Media Entrepreneurship and Marketing paper is a professional application based paper. Students are provided an insight into entrepreneurship, management and the media marketing industry while learning media event management techniques as well.*

MEDIA TECHNOLOGIES

MT-101 COMMUNICATION PRINCIPLES AND PRACTICES

[redacted] *This paper will explore human communication and teach students how this communication is expanded and transmitted thorough the Mass Media and New Media technologies.*

MT -102–ENGLISH LITERATURE AND COMMUNICATION

This paper aims to guide students how to write effectively, read and think analytically and speak confidently. The paper introduces students to various texts, challenges them with writing and speech exercises to broaden not only their vocabulary, but also their creative worldview.

MT -201 -WRITING FOR RADIO, TV AND NEW MEDIA

The aim of this paper is to introduce the students to writing requirement, style, technique and format for different forms of media. The paper will also enlighten the students on various copyright and other ethical issues, along with exposure to some latest scriptwriting softwares such as finaldraft and Celtx.

MT -202–SOUND FOR MEDIA I

This paper is designed to introduce the student to the fundamentals of audio theory and practices through the development of basic digital audio production projects.

MT 301 - PRINCIPLES OF PHOTOGRAPHY

This paper aims to introduce the students to history and techniques of Photography

MT 302–VIDEOGRAPHY

This paper introduces students to video technology and emphasizes on producing, directing, and editing different kinds of short video programmes

MT-303- Journalism

This paper introduces students to journalistic techniques of information gathering and analysis, journalistic norms and values and basic principles of media formats.

MT-401- MEDIA AND CULTURE

The paper will help students understand the importance of culture and the relationship between culture and media. This paper will also encourage students to understand the strategic importance of North East in a national context along with introductory inputs of media research techniques.

MT-402- Sound for Media II

This paper will highlight upon the radio technology and radio programming, sound designing, visual sound interrelationship and field recording techniques

MT-403- INTRODUCTION TO NEW MEDIA

This paper will introduce the students into emerging new media forms and help them to produce and manage content across multiple platforms, including print, radio, the Internet, television, social media and other digital and interactive platforms.

MT-501- MEDIA APPRECIATION

This paper will explore the evolution of the motion picture as a form of expression. The paper emphasizes on film theories, styles and structure, distribution and consumption.

MT-502- MEDIA ENTREPRENEURSHIP AND MANAGEMENT

The Media Entrepreneurship and Management paper is an application based paper. While grasping a thorough comprehension on entrepreneurship, as a professional vocation for media practitioners and the concepts and strategies of managing a media enterprise, students also learn event management techniques.

MT- 503- PHOTOJOURNALISM AND PHOTOGRAPHY PROJECT

This paper introduces the students to the various laws and ethics required for photojournalistic practices. They will also deal with the different genres in photojournalism and how to build a story from their photographs enabling publishing, either in print or digital media.

MT- 601- Communication for Development

This paper will cover areas of participation in communication and content covering various media. The students are expected to learn the key concepts in development and development communication with a substantial component of field work

MT-602- ADVERTISING AND PUBLIC RELATIONS

This paper aims to introduce the functions, strategies and concepts of advertising and public relations. A thorough application based approach is used to provide a sound working knowledge of the advertising and public relations industry.

2.6.1 Programme and course outcomes for all Programmes offered by the Department arestated and displayed on website and communicated to teachers and students.

EDUCATION DEPARTMENT (UG)

Programme Specific Outcomes (PSOs) And Course Outcomes (COs) For Bachelor of Education Offered by St. Anthony's College, Shillong

PROGRAMME SPECIFIC OUTCOMES

The **Department of Education**, St. Anthony's college, Shillong offers the three-year undergraduate Honours course in Education. The Department has a defined set of programme specific outcomes (PSOs) which guides the teaching learning and evaluation process in the Department. on completion of this course the student should attain the following attributes.

PSO-1: The students can acquire knowledge, skills and attitudes during the end of the BA Education degree course.

PSO-2: Students will be able to understand the scientific methods and procedures which have been used in arriving at the facts and principles of educational psychology.

PSO-3: Students will gain confidence in adjusting their personality and understands their own individuality.

PSO-4: Students can also gain practical skills in handling work like teaching, manager, counselling psychologist, researchers and administrators.

PSO-5: Students later will have the ability to construct and develop curriculum in accordance to the needs of the society.

PSO-6: Students will be acquainted and have thorough knowledge about the various system of education that exists in India and other part of the world.

PSO-7: They can undertake project work at ease, in case of recruitment of teachers, they can easily adapt to the situation as they have the pre- requisite knowledge in the art of teaching.

PSO-8: Established the ability to function effectively in complex culturally diverse society in a country like India.

PSO-9: Students will be effective and efficient in application of ICT in the teaching learning process.

PSO-10: Students later in future will prove themselves in different examinations like MPSC, UPSC, DSC, MTET, CTET AND NET.

COURSE OUTCOME (Cos)

The Department follows the syllabus and curriculum structure as mandated by the affiliating University. During the three years of the BA Education (Honours) programme, spread over six semester, 8 papers are taught. The semester wise distribution of the papers and their course outcomes are listed below:

SEMESTER - I	
NAME OF THE PAPER	**COURSE OUTCOMES (Cos)**
EDUCATIONAL PYSCHOLOGY	On completion of the course the students will be able to: **CO-1:** Understand on the meaning of Educational Psychology and the ability to apply the various methods of educational psychology in teaching and learning process. **CO-2:** Explain the different stages of growth and development. **CO-3:** Acquire knowledge on the meaning of intelligence, creativity and personality and gain the ability to adjust or modify their behaviour/personality to adapt to different situations. **CO-4:** Describe and criticize the various theories of Learning and list out the various factors of learning. **CO-5:** Solve and tackle problems in their day-to-day life after having a through understanding on the meaning, natures, scopes and types of guidance and counselling.
SEMESTER-II	
NAME OF THE PAPER	**COURSE OUTCOMES (Cos)**
FOUNDATIONS OF EDUCATION	On completion of the course the students will be able to: **CO-1:** Understand and gain knowledge on the concept of Education and Philosophy. **CO-2:** Argue and analysed on the different philosophies of Education. They will also be able to prioritize and put into

	practice the values brought about by idealism, naturalism and pragmatism. **CO-3:** Learnt on the role and its importance of Education in a democracy. **CO-4: A**bility to perform and engage in various social group for different activity to bring about social change. **CO-5: U**nderstands the structure and functions of the society and the process of social interaction for a change towards better human relationships.
SEMESTER-III	
EDUCATIONAL SYSTEM IN INDIA	On completion of the course the students will be able to: **CO-1:** Explain on the importance of education in Ancient and medieval India. **CO-2:** Compare on the different system of education in colonial India. **CO-3:** Discuss on various constitutional provisions in education. **CO-4:** Create an awareness of the challenges and problems faced by various levels of education in North East India. **CO-5:** List out the various recommendations of National policy of education.
SEMESTER-IV	
EDUCATIONAL THOUGHT AND PRACTICES	On completion of the course the students will be able to: **CO-1:** Apply these educational thoughts in the fields of teaching. **CO-2:** Promote innovative practices in education. **CO-3:** Compare the similarity and differences of educational thoughts put forward by educational thinkers. **CO-4:** Critically analyse the educational thoughts of various educational thinkers. **CO-5:** Discuss on the various educational thoughts and practices of western and Indian.

SEMESTER-V	
EDUCATIONAL EVALUATION AND STATISTICS	On completion of the course the students will be able to: **CO-1:** Understand the concept of measurement and evaluation as applied to education. **CO-2:** Develop the competency in solving various statistical problems. **CO-3:** State the purpose of measurement and evaluation. **CO-4:** Classify the types of correlation and apply the concept and characteristics of Normal probability curve in solving various statistical problems. **CO-5:** Distinguish between measurement and evaluation.
CONTEMPORARY INDIAN EDUCATION	On completion of the course the students will be able to: **CO-1:** Learnt the importance of various Pre-school Education. **CO-2:** Discuss and list out the role and functions of various elementary Education. **CO-3:** Understand and recognise the importance and functions of Secondary Education. **CO-4:** State the purpose of higher education in bringing about quality and excellence in higher education. **CO-5:** Gain insight on the concept, need and scope of Population, Environmental, Human Rights and Women Empowerment through Education.
SEMESTER-VI	
EDUCATIONAL TECHNOLOGY	On completion of the course the students will be able to: **CO-1:** Understand the concept and scope of Educational Technology, communication and teaching. **CO-2:** Classify the types of Educational Technology and classroom Communication. **CO-3:** Explain the various methods of teaching and levels of teaching. **CO-4:** Learnt various skills of teaching and Micro-teaching. **CO-5:** Identify and state the types and uses of teaching aids.

SCHOOL MANAGEMENT	On completion of the course the students will be able to: **CO-1:** Understand the concept of school and classroom management. **CO-2:** Explain the function of school and state the importance of physical infrastructure of school. **CO-3:** Distinguish between inspection and supervision. **CO-4:** Outline the institutional programme and planning. **CO-5:** Apply the techniques of classroom management in their practice teaching.

ST ANTHONYS COLLEGE, SHILLONG
P.G DEPARTMENT OF EDUCATION
COURSE OUTCOMES (CO)

Semester	Papers	Course Outcomes
1st Semester	EDN(C):101- Philosophical Foundation of Education	CO1: Classify the application of philosophical approaches to education.
	EDN(C):102- Advanced Educational Psychology	CO2: Identify the impact of the theories of motivation and learning in classroom transaction.
	EDN(C):103- Educational Management and Change	CO3: Reflects on the modern techniques and issues in educational management.
	EDN(C):104- Research Methodology in Education- I	CO4: Develop the skills and the use of probability distribution in education
	EDN(C):105- Research Methodology in Education- II	CO5:Identify the different methods of research
2nd Semester	EDN(C) 201: Curriculum Development and Instruction	CO6:Differentiate between a curriculum and a syllabus
	EDN(C) 202: Sociology of Education-	CO7:Examine the role of education in cultural perspective
	EDN(C) 203: Educational Testing and Evaluation	CO8:Insight on the applicability of Parametric and Non-Parametric tests
	EDN(O) 204: Environmental Education	CO9:Acquaint with environmental pollution and sustainable develop-ment
	EDN(O) 205: Mental Health Education	CO10:Describe mental health, hygiene and its importance for human lives
3rd Semester	EDN(C): 301 Information and Communication Technology (ICT) in Education	CO11:Conceptualized ICT for instructional system
	EDN(O): 302 Comparative Education	CO12:Analyze and compare the educational system in different countries
	EDN(C):303.02 Early Childhood Education	CO13:Acquaints the students with early childhood education and development of children

	EDN(C): 304.03 Teacher Education-I	CO14:Classify the different agencies of teacher education
	EDN(O) 305: Education in Political Perspective	CO15:Identify the role of education in political development of the country
4th Semester	EDN(C) 401: Laboratory Practicals	CO16:Explores the personality domain of individuals
	EDN (C) 402: Higher Education in India	CO17:Generalize a descriptive idea of the various policy perspective in higher education
	EDN(C) 403.01:Guidance and Counselling	CO18:Bringing out the difference between guidance and counselling and its impact in day to day life
	EDN(C) 404.03: Teacher Education-II	CO19:Insight and reflect on the Effective Tertiary Teaching
	EDN(C)405: Economics of Education	CO20:Identify the importance of education and economic development

-

Programme Specific Outcome - BSc Computer Science

Able to grasp some papers that are core to the field of computer science.
Get a clear understanding of the recent areas of computing
Learn the foundations of core subjects and fields that are basic to the field of computer science

Course Outcomes B.Sc. Computer Science

CS101T: Data Structures using C
Get introduced to the fundamentals of C programming language
Analyse step by step with regard to real world problems
Understand File handling in C
Grasp the basics of Graphics programming.
Understand Linear and Nonlinear data structures: Arrays, lists, stacks, queues, trees and graphs
Learn complexity analysis while implementing the various sorting and searching methods

CS101P: Data Structures using C
Develop the skills for solving problems using computers.
Develop programs to solve real world problems
Implement Linear and Nonlinear data structures: Arrays, lists, stacks, queues, trees and graphs
Implement various sorting and searching methods

CS 201T Digital Logic and Computer Architecture
Get introduced to the concepts of Digital Logic
Simplify Boolean expressions in Boolean algebra

CS301T: Database Management System
Get introduced to the fundamental concepts necessary for designing database systems and applications.
Understand database modeling and design, physical file storage techniques
Learn the language facilities provided by database management systems.

CS301P: Database Management System
Implement database systems and applications.
Implement the concepts of a database system practically.
Make use of RDBMS software

CS401T: Data Communications and Computer Networks
Get an understanding of the basic concepts underlying computer networks
Understand the mechanisms underlying computer networks and web technology
CS501T : Operating Systems and Introduction to Linux (Theory)
Get introduced to Operating System.
Grasp the concepts of processes, memory management, file management, Input/Output management and the potential problem of deadlocks.

CS501P : Operating Systes and Introduction to Linux (Practical)
Learn the various Unix/Linux commands while working in the Unix/Linux environment.
Able to write shell script programs to perform some computations
Use the various unix commands through scripts.

CS502AT: Computer Graphics
Grasp the concept of graphics
Understand the algorithms to implement the concepts of graphics

CS502AP: Computer Graphics
Practically implement the concepts of computer graphics

CS502BT: Programming using VB.NET
Learn Visual Basic
Use the .NET framework,
Learn more about the programming logic

S502BP: Programming using VB.NET
Do database programming
Make use of Web application

CS502CT: Object Oriented Programming through Java
Develop the skills that are required to solve real world problems by using object-oriented approach utilizing Java language constructs.
Get introduced to the Java Language and Java Library
Understand the Java tokens for creating expressions and creating data types.
Use the various expressions and data types that are assembled in packages.
Grasp the Java I/O basics and Applets.

CS502CP: Object Oriented Programming through Java
Implement inheritance, Exception handling and Multithreading in Java.
Do Network Programming in Java.
Access the relational databases from Java program.
Make use of Servlets.

CS601T: Software Engineering
Develop the engineering approach to developing software.
Get a broad understanding of system development concepts
Gain a sense of confidence to develop new systems.

CS601P: Project
Consolidate the concepts and practices that were learned during the course
Apply concretely in a small package the concepts gained from Software Engineering.

CS602AT: Compiler Design
Get introduced to the abstract, mathematical models of computation (such as finite state, push down & Turing machines)
Use the abstract machines models to study the ability to solve computational problems
Get introduced to Compiler
Understand the process by which programs written in high-level languages are translated and executed.
Able to use regular expression effectively and appropriately,
Construct derivations and parse trees.
Understand the equivalence of grammars, languages & automata

CS602BT : Artificial Intelligence

Get guidance for the design of intelligent machines
Gather fundamental AI ideas that underlay many of the AI applications
Develop a base for understanding natural intelligence.

CS602CT: Data Mining

Get introduced to the concept and various techniques of data mining
Learn the feasibility, usefulness, efficiency and the scalability of the techniques for discovery of patterns hidden in large databases.

Programme Specific Outcome – MCA

The programme, Master of Computer Application is to prepare the candidates for the IT industry.
To develop skills to make the successful candidates proficient in software development, paving the way for self-employment.
To be effective programmers in areas like Database, Application Programming, System Level Programming, and Network and Internet Technologies.
To venture into Open Source Software platform and emerging technologies.
To enable to take up specialisation by choosing the desired electives.
Development of soft skills necessary for the employment market, by involving Audit courses.

Course Outcomes - MCA

MCA-0701 Programming and Problem Solving through C
Understand C fundamentals
Understand Functions, Arrays and Pointer
Understand Structure and Union and Data files
Understand VDU and keyboard basics
Use Graphics and Mouse programming

MCA-0702 Digital Logic and Design
Solve numerical problems on conversion of numbers from one number system to another
Get introduced to memory hierarchy
Use Karnaugh map to simplify Boolean expressions
Understand Combinational and sequential circuits

MCA-0703 Discrete Mathematics Understand sets
Understand Algebraic structures
Understand Combinations and graph theory
Understand probability theory
Use random variables and probability distributions

MCA-0704 Operating Systems
Get introduced to Operating System.
Grasp the concepts of processes, memory management, file management, Input/Output management and the potential problem of deadlocks.

MCA-0705 Theory of Computation
Understand automata
Understand formal languages
Understand context free languages
Design Turing machine

MCA-0716 Programming and Problem Solving through C Lab
Understand processes and threads
Understand deadlocks and memory management
Understand input, output and file systems
Ability to use Linux

MCA-0717 Operating Systems Lab
Ability to use Linux commands
Use processes and signals

MCA-0801 Object Oriented Programming and C++
Understand object oriented programming
Use exception handling
Write program involving inheritance
Make use of object oriented design

MCA-0802 Data Structure and Algorithms
Write programs using arrays and linked lists
Use stacks and queues
Traverse the trees and graphs
Write program for searching and sorting

MCA-0803 Computer Graphics
Get an overview of Computer Graphics
Understand algorithms for output primitives
Understand geometric transformations
Understand the dimensional viewing
Understand Three dimensional concepts

MCA-0804 Computer Organization and Architecture
Understand the Arithmetic Logic Unit
Understand the Control Unit
Understand Parallel Processing
Understand Memory Organization
Understand input Output Organization

MCA-0817 Data Structure and Algorithms Lab
Write programs using arrays and linked lists
Use stacks and queues
Traverse the trees and graphs
Write program for searching and sorting

MCA-0901 Software Engineering
Plan the project
Check for quality assurance
Understand the design of real time systems
Test the software

MCA-0902 Database Management System
Draw ER diagrams
Make use of SQL
Able to normalize relations
Understand file organization

MCA-0903 Data Communication and Computer Networks
Understand Reference model
Understand physical later
Understand data link later
Understand Medium Access Control sub layer

MCA-0904 System Programming and Compiler Design
Understand parsing
Design a two pass assembler
Understand macros
Do programming in Perl
Understand translation
Understand lexical analysis
Make use of basic parsing techniques
Makes use of parse trees
Optimize the code

Elective Papers of Third Semester:

Elective-II
1 MCA-0905.1 Artificial Intelligence
406.5 Artificial Intelligence
Get the base for understanding natural Intelligence
Understand AI techniques
Understand search strategies for AI production systems
Understand knowledge representation issues
Understand Natural Language Processing

Fourth Semester
MCA-1011 Dissertation / Project
Able to consolidate the concepts and practice that were learned during the course
Able to apply concisely in a small package the concept gained from software engineering.

406.2 Microprocessors and the interfacing
Get familiarized with the instruction set
Get introduced to the assembly language
Make user of loops in assembly language
Understand interrupt
Under the basic concepts of DMA
Understand serial I/O

406.3 Computer Oriented Numerical Methods
Use Newton Raphson method
Solve the equations
Understand interpolation
Understand numerical differerentiation and integration
Derive finite differential approximations

406.4 Advanced Linux Programming
Develop programs using CORBA
Review the kernel
Perform error handling
Understand device drivers
Make use of GTK+
Make use of CORBA

406.6 Network Security
Understand encryption techniques
Understand symmetric ciphers
Use public key
Use digital signature

406.7 Digital Image Processing
Understand the fundamentals of digital image processing
Make use of Fourier transforms
Use image enhancement and resolution
Use image compression
Understand image analysis

504.1 Simulation and Modeling
Get introduced to the concept of a system
Understand techniques of Simulation
Make use of probability concept in Simulation
Arrive at mathematical solution of queuing problems
Use GPSS

504.2 Parallel and Distributed Processing
Get introduced to computer organization
Understand computer network
Understand client-server system
Understand distributed systems
Make use of LISP

504.3 Multimedia technology and applications
Get introduced to Multimedia systems
Use file format standards
Create hyper media messages
Understand streaming audio

504.4 Enterprise Resource Planning
Get introduced to Online Analytical Processing (OLAP)
Understand the ERP modules
Get an overview of R/3 systems
Understand ERP implementation lifecycle
Discuss case studies related to success stories / benefits / difficulties

504.5 e-commerce
Understand e-commerce applications
Design a web site
Discuss the pros and cons of online shopping
Understand electronic payment systems
Aware of electronic security

504.6 Natural Language Processing
Get introduced to NLP
Deal with spelling errors
Understand context free grammars
Understand semantic analysis
Understand machine translation

504.7 Data Mining

Get introduced to Data Mining
Understand OLAP technology for data mining
Understand data processing
Use mining association rules
Perform mining on complex types of data
Get introduced to DBMiner

504.8 Embedded and real time systems

Get introduced to Embedded systems
Understand embedded system development cycle
Get an overview of embedded operating systems
Make an overview of RT Linux

Programme Specific Outcome - PGDCA

Acquire adequate expertise to utilise computers for maximum benefit in an Office or Business environment.
Able to develop one's own programs to enhance productivity in such an environment.
Equipped to be able to teach Computer Applications in Higher Secondary Schools.
Gather necessary skills to be proficient in software development, paving the way for self-employment.

Course Outcomes PGDCA

DCA-101 : DIGITAL LOGIC AND COMPUTER ORGANISATION

Grasp some of the basic concepts of computer organization.
Get introduced to digital logic devices
Simplify Boolean expressions using Boolean algebra.
Understand how data is represented and processed within a computer system.

DCA-102 : DATA COMMUNICATIONS AND NETWORKING

Get an understanding to the basic concepts and mechanisms underlying data communications and networking

DCA-103 : DATABASE MANAGEMENT SYSTEM

Design, use and implement database systems and applications.
Understand modeling and design, physical file storage techniques and language facilities provided by database management systems.
Get an overview of some of the emerging database technologies and applications.

DCA -104 : PROBLEM SOLVING & PROGRAMMING USING C

Get introduced to the fundamentals of C programming language
Develop the skills for solving problems using computers.
Able to design and program real world problems using C.

DCA-105 : ACCOUNTING AND FINANCIAL MANAGEMENT

Get familiar with the basic accounting and financial management concepts.
Gather knowledge of accounting that may be required when faced with the task of developing or maintaining any package for any business/financial institutions as well as for non profit organisations.

DCA -106 : Practical 1 (PROBLEM SOLVING & PROGRAMMING USING C)

Write programs in C for the given assignments and more.

DCA-207: PROGRAMMING FOR THE WORLD WIDE WEB

Gather comprehensive knowledge to the programming tools
Build and maintain Web documents and Websites on the Web.
Get an overview of how the World Wide Web works.

DCA-208: PROGRAMMING IN VB.NET

Get introduced to the .NET framework, to provide support for just about any imaginable area of programming – desktop, Internet, database.
Able to learn the language
Learn programming logic, the .NET framework, Database programming, and Web application.

DCA-209 : SOFTWARE ENGINEERING

Get a view of Software Engineering as the engineering approach to developing software.
Get a broad understanding of system development concepts
Develop a sense of confidence to develop new systems.

DCA-210 : Practical 2 (PROGRAMMING FOR THE WORLD WIDE WEB)

Write programs given in the practical assignments and more.

DCA-211 : Practical 3 - PROGRAMMING IN VB.NET

Get a strong practical foundation in Visual programming including Crystal Report, Menu Design & DataBase Management.
Use procedures and Functions
Create Menus, using Rich Text Box
Develop powerful applications with less programming effort to prepare for the next generation programming.
Solve Practical problems apart from the given list

DCA-212 : PROJECT

Consolidate the concepts and practices that were imparted during the course
Be enabled to apply concretely in a small package the concepts gained from System Analysis and Design.
Get prepared for Viva-Voce
Learn to use documentation
Create a data dictionary
Make a user manual

Programme Specific Outcome – MCA

The programme, Master of Computer Application is to prepare the candidates for the IT industry.
To develop skills to make the successful candidates proficient in software development, paving the way for self-employment.
To be effective programmers in areas like Database, Application Programming, System Level Programming, and Network and Internet Technologies.
To venture into Open Source Software platform and emerging technologies.
To enable to take up specialisation by choosing the desired electives.
Development of soft skills necessary for the employment market, by involving Audit courses.

Programme Specific Outcome - BSc Computer Science

Able to grasp some papers that are core to the field of computer science.
Get a clear understanding of the recent areas of computing
Learn the foundations of core subjects and fields that are basic to the field of computer science

Programme Specific Outcome - PGDCA

Acquire adequate expertise to utilise computers for maximum benefit in an Office or Business environment.
Able to develop one's own programs to enhance productivity in such an environment.
Equipped to be able to teach Computer Applications in Higher Secondary Schools.
Gather necessary skills to be proficient in software development, paving the way for self-employment.

Course Outcomes - MCA

MCA-0701 Programming and Problem Solving through C
Understand C fundamentals
Understand Functions, Arrays and Pointer
Understand Structure and Union and Data files
Understand VDU and keyboard basics
Use Graphics and Mouse programming

MCA-0702 Digital Logic and Design
Solve numerical problems on conversion of numbers from one number system to another
Get introduced to memory hierarchy
Use Karnaugh map to simplify Boolean expressions
Understand Combinational and sequential circuits

MCA-0703 Discrete Mathematics Understand sets
Understand Algebraic structures
Understand Combinations and graph theory
Understand probability theory
Use random variables and probability distributions

MCA-0704 Operating Systems
Get introduced to Operating System.
Grasp the concepts of processes, memory management, file management, Input/Output management and the potential problem of deadlocks.

MCA-0705 Theory of Computation
Understand automata
Understand formal languages
Understand context free languages
Design Turing machine

MCA-0716 Programming and Problem Solving through C Lab
Understand processes and threads
Understand deadlocks and memory management

Understand input, output and file systems
Ability to use Linux

MCA-0717
Operating Systems
Lab

Ability to use Linux commands

Use processes and signals

MCA-0801
Object
Oriented
Programming
and
C++

Understand object oriented programming
Use exception handling
Write program involving inheritance
Make use of object oriented design

MCA-0802 Data Structure
and
Algorithms

Write programs using arrays and linked lists
Use stacks and queues
Traverse the trees and graphs
Write program for searching and sorting

MCA-0803 Computer Graphics

Get an overview of Computer Graphics
Understand algorithms for output primitives
Understand geometric transformations
Understand the dimensional viewing
Understand Three dimensional concepts

MCA-0804
Computer
Organization
and
Architecture

Understand the Arithmetic Logic Unit
Understand the Control Unit
Understand Parallel Processing
Understand Memory Organization

Understand input Output Organization

MCA-0817 Data Structure and Algorithms Lab

Write programs using arrays and linked lists
Use stacks and queues
Traverse the trees and graphs
Write program for searching and sorting

MCA-0901 Software Engineering

Plan the project
Check for quality assurance
Understand the design of real time systems
Test the software

MCA-0902

Database Management System

Draw ER diagrams
Make use of SQL
Able to normalize relations
Understand file organization

MCA-0903 Data Communication and Computer Networks

Understand Reference model
Understand physical later
Understand data link later
Understand Medium Access Control sub layer

MCA-0904 System Programming and Compiler Design

Understand parsing
Design a two pass assembler
Understand macros
Do programming in Perl

Understand translation
Understand lexical analysis
Make use of basic parsing techniques
Makes use of parse trees
Optimize the code

MCA-0916
Database
Management
System Lab

MCA-0917
Data
Communications
and Network
Programming Lab

Elective Papers of Third Semester:
Elective-II
1 MCA-0905.1 Artificial Intelligence
406.5 Artificial Intelligence
Get the base for understanding natural Intelligence
Understand AI techniques
Understand search strategies for AI production systems
Understand knowledge representation issues
Understand Natural Language Processing

Fourth Semester

MCA-1011
Dissertation /
Project
Able to consolidate the concepts and practice that were learned during the course
Able to apply concisely in a small package the concept gained from software engineering.

406.2 Microprocessors and the interfacing
Get familiarized with the instruction set
Get introduced to the assembly language
Make user of loops in assembly language
Understand interrupt
Under the basic concepts of DMA
Understand serial I/O
406.3 Computer Oriented Numerical Methods
Use Newton Raphson method
Solve the equations
Understand interpolation
Understand numerical differerentiation and integration
Derive finite differential approximations
406.4 Advanced Linux Programming
Develop programs using CORBA
Review the kernel
Perform error handling
Understand device drivers
Make use of GTK+
Make use of CORBA

406.6 Network Security
Understand encryption techniques

Understand symmetric ciphers
Use public key
Use digital signature

406.7 Digital Image Processing

Understand the fundamentals of digital image processing
Make use of Fourier transforms
Use image enhancement and resolution
Use image compression
Understand image analysis

504.1 Simulation and Modeling

Get introduced to the concept of a system
Understand techniques of Simulation
Make use of probability concept in Simulation
Arrive at mathematical solution of queuing problems
Use GPSS

504.2 Parallel and Distributed Processing

Get introduced to computer organization
Understand computer network
Understand client-server system
Understand distributed systems
Make use of LISP

504.3 Multimedia technology and applications

Get introduced to Multimedia systems
Use file format standards
Create hyper media messages
Understand streaming audio

504.4 Enterprise Resource Planning

Get introduced to Online Analytical Processing (OLAP)
Understand the ERP modules
Get an overview of R/3 systems
Understand ERP implementation lifecycle

Discuss case studies related to success stories / benefits / difficulties

504.5 e-commerce

Understand e-commerce applications
Design a web site
Discuss the pros and cons of online shopping
Understand electronic payment systems
Aware of electronic security

504.6 Natural Language Processing

Get introduced to NLP
Deal with spelling errors
Understand context free grammars
Understand semantic analysis
Understand machine translation

504.7 Data Mining

Get introduced to Data Mining
Understand OLAP technology for data mining
Understand data processing
Use mining association rules
Perform mining on complex types of data
Get introduced to DBMiner

504.8 Embedded and real time systems

Get introduced to Embedded systems
Understand embedded system development cycle
Get an overview of embedded operating systems
Make an overview of RT Linux

Course Outcomes B.Sc. Computer Science

CS101T: Data Structures using C

Get introduced to the fundamentals of C programming language
Analyse step by step with regard to real world problems
Understand File handling in C
Grasp the basics of Graphics programming.
Understand Linear and Nonlinear data structures: Arrays, lists, stacks, queues, trees and graphs
Learn complexity analysis while implementing the various sorting and searching methods

CS101P: Data Structures using C

Develop the skills for solving problems using computers.
Develop programs to solve real world problems
Implement Linear and Nonlinear data structures: Arrays, lists, stacks, queues, trees and graphs
Implement various sorting and searching methods

CS 201T Digital Logic and Computer Architecture

Get introduced to the concepts of Digital Logic
Simplify Boolean expressions in Boolean algebra

CS301T: Database Management System

Get introduced to the fundamental concepts necessary for designing database systems and applications.
Understand database modeling and design, physical file storage techniques
Learn the language facilities provided by database management systems.

CS301P: Database Management System

Implement database systems and applications.
Implement the concepts of a database system practically.
Make use of RDBMS software

CS401T: Data Communications and Computer Networks

Get an understanding of the basic concepts underlying computer networks
Understand the mechanisms underlying computer networks and web technology

CS501T : Operating Systems and Introduction to Linux (Theory)

Get introduced to Operating System.

Grasp the concepts of processes, memory management, file management, Input/Output management and the potential problem of deadlocks.

CS501P : Operating Systes and Introduction to Linux (Practical)

Learn the various Unix/Linux commands while working in the Unix/Linux environment.
Able to write shell script programs to perform some computations
Use the various unix commands through scripts.

CS502AT: Computer Graphics

Grasp the concept of graphics
Understand the algorithms to implement the concepts of graphics

CS502AP: Computer Graphics

Practically implement the concepts of computer graphics

CS502BT: Programming using VB.NET

Learn Visual Basic
Use the .NET framework,
Learn more about the programming logic

S502BP: Programming using VB.NET

Do database programming
Make use of Web application

CS502CT: Object Oriented Programming through Java

Develop the skills that are required to solve real world problems by using object-oriented approach utilizing Java language constructs.
Get introduced to the Java Language and Java Library
Understand the Java tokens for creating expressions and creating data types.
Use the various expressions and data types that are assembled in packages.
Grasp the Java I/O basics and Applets.

CS502CP: Object Oriented Programming through Java

Implement inheritance, Exception handling and Multithreading in Java.
Do Network Programming in Java.
Acces the relational databases from Java program.

Make use of Servlets.

CS601T: Software Engineering

Develop the engineering approach to developing software.
Get a broad understanding of system development concepts
Gain a sense of confidence to develop new systems.

CS601P: Project

Consolidate the concepts and practices that were learned during the course
Apply concretely in a small package the concepts gained from Software Engineering.

CS602AT: Compiler Design

Get introduced to the abstract, mathematical models of computation (such as finite state, push down & Turing machines)
Use the abstract machines models to study the ability to solve computational problems
Get introduced to Compiler
Understand the process by which programs written in high-level languages are translated and executed.
Able to use regular expression effectively and appropriately,
Construct derivations and parse trees.
Understand the equivalence of grammars, languages & automata

CS602BT : Artificial Intelligence

Get guidance for the design of intelligent machines
Gather fundamental AI ideas that underlay many of the AI applications
Develop a base for understanding natural intelligence.

CS602CT: Data Mining

Get introduced to the concept and various techniques of data mining
Learn the feasibility, usefulness, efficiency and the scalability of the techniques for discovery of patterns hidden in large databases.

Course Outcomes PGDCA

DCA-101 : DIGITAL LOGIC AND COMPUTER ORGANISATION

Grasp some of the basic concepts of computer organization.
Get introduced to digital logic devices
Simplify Boolean expressions using Boolean algebra.
Understand how data is represented and processed within a computer system.

DCA-102 : DATA COMMUNICATIONS AND NETWORKING

Get an understanding to the basic concepts and mechanisms underlying data communications and networking

DCA-103 : DATABASE MANAGEMENT SYSTEM

Design, use and implement database systems and applications.
Understand modeling and design, physical file storage techniques and language facilities provided by database management systems.
Get an overview of some of the emerging database technologies and applications.

DCA -104 : PROBLEM SOLVING & PROGRAMMING USING C

Get introduced to the fundamentals of C programming language
Develop the skills for solving problems using computers.
Able to design and program real world problems using C.

DCA-105 : ACCOUNTING AND FINANCIAL MANAGEMENT

Get familiar with the basic accounting and financial management concepts.
Gather knowledge of accounting that may be required when faced with the task of developing or maintaining any package for any business/financial institutions as well as for non profit organisations.

DCA -106 : Practical 1 (PROBLEM SOLVING & PROGRAMMING USING C)

Write programs in C for the given assignments and more.

DCA-207: PROGRAMMING FOR THE WORLD WIDE WEB

Gather comprehensive knowledge to the programming tools
Build and maintain Web documents and Websites on the Web.
Get an overview of how the World Wide Web works.

DCA-208: PROGRAMMING IN VB.NET

Get introduced to the .NET framework, to provide support for just about any imaginable area of programming – desktop, Internet, database.
Able to learn the language
Learn programming logic, the .NET framework, Database programming, and Web application.

DCA-209 : SOFTWARE ENGINEERING

Get a view of Software Engineering as the engineering approach to developing software.
Get a broad understanding of system development concepts
Develop a sense of confidence to develop new systems.

DCA-210 : Practical 2 (PROGRAMMING FOR THE WORLD WIDE WEB)

Write programs given in the practical assignments and more.

DCA-211 : Practical 3 - PROGRAMMING IN VB.NET

Get a strong practical foundation in Visual programming including Crystal Report, Menu Design & DataBase Management.
Use procedures and Functions

Create Menus, using Rich Text Box
Develop powerful applications with less programming effort to prepare for the next generation programming.
Solve Practical problems apart from the given list

DCA-212 : PROJECT

Consolidate the concepts and practices that were imparted during the course
Be enabled to apply concretely in a small package the concepts gained from System Analysis and Design.
Get prepared for Viva-Voce
Learn to use documentation
Create a data dictionary
Make a user manual

MCA-0816
Object Oriented
Programming and
C++ Lab

304 Design and analysis of algorithms
Analyze recursive programs
Perform sorting
Analyze shortest path algorithm
Use the Turing machine
Comprehend the issues in memory management
305 GUI programming with VB.NET
Start using Visual Basic
Make use of procedures
To prepare the ADO.NET object
Build web application
304 Design and analysis of algorithms
Analyze recursive programs
Perform sorting
Analyze shortest path algorithm
Use the Turing machine
Comprehend the issues in memory management
305 GUI programming with VB.NET
Start using Visual Basic
Make use of procedures
To prepare the ADO.NET object
Build web application
402: Data Communication and Networks - II and Network Programming using Linux (Theory)
Understand transport layer
Understand application later
Make use of data encryption for security
402: Data Communication and Networks - II and Network Programming using Linux (Practical)
Do network programming
Make use of functions like readline
403: Oracle (Theory)
Create tables
Get introduced to SQL
Administer the database
403: Oracle (Practical)
Use SQL
Create the forms
Create the reports
404: Database Management System - II
Perform query processing
Understand transaction Processing
Understand security
Understand client server systems
405: Internet Technology and Applications (Theory)
Makes use of browsers
Understand XHTML
Understand XML
Convert the address
Understand IP4, IP6 interoperability
Understand Daemon process
Get introduced to web servers
Understand how to design a website
Use PHP

405: Internet Technology and Applications (Practical)
Make use of XHTML, XML

Design a website
Use PHP

502: Programming thorough Java

Develop skills to solve real world problems using object oriented approach utilizing Java language constructs.
Do object oriented programming using Java
Implement exception handling and multitasking in Java
Create Java I/O applications and Applets
Set up a GUI using swing component
Do network programming in Java
Access relational Database from Java program using Java Beans and Servlets

505: Minor project

Able to consolidate the concepts and practice that were learned during the course
Able to apply concisely in a small package the concept gained from software engineering.

Audit Course : Communication Skills

Develop self confidence

Aquire skills to present oneself to others, whether it be an interview board or a larger audience
Identify one's own strengths and weaknesses in the area of communication
Make an extempore speech
Participate in group discussions
Develop a resume
Involve in practice sessions for interviews
Perform self evaluation

Audit Course: Ethics

Stimulate thinking and research on ethical behaviour and business ethics initiatives
Able to deal with issues and objectives related to decision making as an individual, organization, or as a society
Able to confront the nature and importance of business ethics.
Take on challenges for further ethical behavior
Understand environment and pollution
Use ethics in advertising
Solve conflicts
Make ethical judgement
Discuss case studies on- Case on Napster's Revolution, Philip Morris' Troubles, AIDS and Needles

Audit Course: Entrepreneurship

Understand the entrepreneurial process
Create a new venture
Make user of pointers essential for success
Use PERT / CPM
Make a market research
Develop strategies for marketing
Understand the changing international environment
Develop time management

406.1 Operations Research

Make appropriate use of computer skills for facilitating executive decision making.
Understand linear programming

Understand non-linear programming
Understand decision making
Solve numerical problems

Course outcomes and Programme Outcomes

Department of Khasi

Course Outcome

Semester – I
Khasi Elective
Paper – I
Paper Code No: KHELH – 101
Name of the Paper – Culture in Khasi Literature

In this paper students will learn on some of the cultural aspects of the Khasis. Firstly, they will learn the traditional marriage rituals practiced by the Khasis. Secondly, they will learn the traditional judiciary system of the Khasis. Thirdly, they will also learn the monolith culture of the Khasis. Fourthly, the students will also learn the traditional folk literature of the Khasis.

Semester – II
Khasi Elective
Paper – II
Paper Code No: KHELH – 201
Name of the Paper – History of Khasi Literature

Through this paper the students will learn the literary history of the Khasis. It is expected that a student will have a knowledge on the literary history of Khasi Drama, Khasi Poetry, Khasi Fiction and Khasi Prose writings.

Semester – III
Khasi Elective
Paper – III
Paper Code No: KHELH – 301
Name of the Paper – Khasi Language Study

This paper focuses on the study of Khasi language. In general, the students will learn the basic concepts of linguistics and language and in particular they will learn the historical aspect of Khasi language and the different aspects of linguistics study in Khasi language.

Semester – IV
Khasi Honours
Paper – IV
Paper Code No: KHH – 401
Name of the Paper – Khasi Literary Criticism

In this paper students will learn the basic concepts of literary criticism. Students will learn the meaning of criticism, types of criticism, functions of criticism. Also students will learn the different aspects of novel, drama and poetry.

Semester – V
Khasi Honours
Paper – V
Paper Code No: KHH – 501
Name of the Paper – Khasi Drama

This paper has four text of Khasi Drama. In this paper students will be familiarizing with the story, themes, techniques and structural innovations. Students will also learn the relevance of the theme and issues as reflected in the four texts, with the situation of the present society in particular and the present world in general.

Semester – VI
Khasi Honours
Paper – VI
Paper Code No: KHH – 502
Name of the Paper – Khasi Fiction

This paper has four text of Khasi fiction. In this paper students will be familiarizing with the story, themes, techniques and structural innovations. Students will also learn the relevance of the theme and issues as reflected in the four texts, with the situation of the present society in particular and the present world in general.

Semester – VII
Khasi Honours
Paper – VII
Paper Code No: KHH – 601
Name of the Paper – Literature in Translation

In this paper student will be familiarize with literature of western writer through translated texts/version. Students will learn the translated poetic genre of ballad and elegy, in fiction they will learn the fictional allegory and in drama they will learn the dramatic genre of farce. Through the analysis of themes and issues students will be able to have some knowledge on the culture and society of the western world.

Semester – VIII
Khasi Honours
Paper – VIII
Paper Code No: KHH – 602
Name of the Paper – Khasi Poetry

In this paper students will learn the traditional Khasi poetry called *ka phawar*. Students will also learn the poetic genres of elegy, lyric, sonnet, ballad and allegory. Beside learning the poetic genres, students will also be familiarizing with the dominant theme and issues as represented by the authors.

Semester – IV
Khasi MIL for BA
Paper – I
Paper Code No: KH MIL – 401

This paper is divided into three parts, that is, Part A: Poetry, Part B: Drama and Part C: Fiction and Prose. In poetry students will learn how environment is a source of inspiration to humans. In drama students will learn the historical events of the Khasi chief with the East India Company. And in fiction and prose students will learn some of the social issues prevalent in the Khasi society and they will also learn the basic concept of Khasi moral ethics.

Semester – IV
Khasi MIL for BCom
Paper – I

This paper is divided into three parts, that is, Part A: Fiction and Prose, Part B: Poetry and Part C: Letter and Report writing in Khasi. In prose and fiction students will learn on what is the basic knowledge a business needs to know, the agricultural activities of the Khasis and challenges. In poetry they will learn the destruction of forest land by felling trees for business purpose. And in letter and report writings students will learn how to write business letters and business reports. Also they will learn on the different forms of writings of business letters and business reports.

Programme Outcomes

The objectives of the programme is to educate the students in the artistry and utility of Khasi language through the study of Khasi literature, language and culture. To encourage students in literary creativity writings. To prepare the students to be academically excellence, intellectually competent, morally upright, socially committed and spiritually inspired person. Graduates students are capable to perform research, critical analysis and to critically appreciate the cultural texts of the different periods of time.

The study of Khasi poetry, Khasi Drama and Khasi Fiction will make the students to be familiar with the Khasi literary text and genres. They should be able to apply the critical and theoretical approaches to the reading and analysis of not only literary text but also of a cultural text. It is expected that students should be able to identify, interpret and describe the critical ideas, values, themes and issues that are present in a literary and cultural text. They should understand how these themes, issues, ideas and values are still relevant or not in the present society. Students are capable to write critical appreciations, to analyse and to interpret texts. Students should be able to gather knowledge from secondary resources from a variety of written and electronic sources. Last but not the least students should be able to understand how to communicate and interpret human experiences, activities, the ethic and ethnic values through literary representation.

Programme Specific Outcomes (PSOs)
and
Course Outcomes (COs)

For

Bachelor of Science in Physics Programme

The Department of Physics,

St. Anthony's College,

Shillong

PROGRAMME SPECIFIC OUTCOMES

The Department of Physics, St. Anthony's College, Shillong offers the three year undergraduate Honours course in Physics. The Department has a defined set of Programme Specific Outcomes (PSOs) which guides the teaching learning and evaluation process in the Department. On completion of this course the student should attain the following attributes.

PSO1. A scientific attitude and temperament

PSO2. Acquire a comprehensive knowledge and sound understanding of the fundamentals of the subject and its relevance to the present context.

PSO3. Develop practical, analytical and mathematical skills in the subject.

PSO4. Develop skills of experimental techniques, measurement, data analysis, calculation and error estimation.

PSO5. Be able to apply one's knowledge and understanding of the subject and skills to new contexts

PSO6. Be able to identify and analyze problems and issues and seek solutions to real - life problems.

PSO7. Demonstrate subject-related and transferable skills that are relevant to Physics - related jobs and other employment opportunities.

PSO8. Develop the ability to transmit technical information relating to all areas in Physics in a clear and concise manner in writing and oral for better understanding.

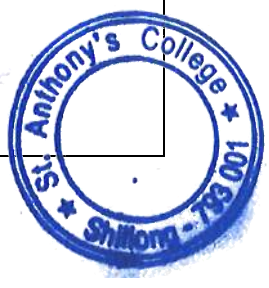
PSO9. Attain sufficient conceptual knowledge of the subject needed for higher studies and research in the subject

PSO10. Be capable of self-paced and self-directed learning aimed at personal development and for improving knowledge and skills in all areas of Physics.

COURSE OUTCOMES (COs)

The Department follows the syllabus and curriculum structure as mandated by the affiliating University. During the three years of the BSc Physics Honours programme, spread over 6 semesters, 8 theory papers and 5 practical papers are taught. The Semester wise distribution of the Papers and their Course Outcomes are listed below.

SEMESTER-I	
Name of the Paper: Mathematical Physics-I, Mechanics, Waves and Acoustics **Paper Code:** PHY01(T)	Upon completion of this course the students will learn, understand and develop the concepts of **CO1.** Vector algebra **CO2.** Ordinary differential equations **CO3.** Frames of reference and their applications **CO4.** Conservative forces, their properties and applications **CO5.** Dynamics of a system of particles and its applications to different systems **CO6.** Rigid body dynamics **CO7.** Theory of Elasticity and its applications **CO8.** Dynamics of fluids **CO9.** Simple harmonic motions and its applications **CO10.** Oscillations and waves **CO11.** Ultrasonics their properties and applications **CO12.** Sound and acoustics
SEMESTER-II	
Name of the Paper: Electromagnetism, Electronics – I	Upon completion of this course the students are expected to learn, understand and develop the concepts of **CO1.** Theory of electrostatics **CO2.** Electric fields in Dielectric media **CO3.** Electrical images and its applications



Paper **Code:** PHY02(T)	**CO4.** Magnetostatics **CO5.** LR, CR and LCR circuits - Series and Parallel **CO6.** Basics of Power supply **CO7.** Laws of Mutual and self inductance and their applications **CO8.** Maxwell's equations **CO9.** Basic circuit analysis **CO10.** Analog and Digital signals **CO11.** Elementary digital electronics and Boolean algebra
Name of the Paper: Experimental Physics-I **Paper Code:** PHY02(P)	Upon completion of this course, students will understand the theory and be able to perform the following experiments and apply the underlying principles to perform other such experiments. Also it should help them develop conceptual knowledge of the underlying theory through experiential learning. **CO1.** Determination of the value of acceleration due to gravity using compound pendulums **CO2.** Determination of the moment of inertia by using torsional pendulum. **CO3.** Determination of the rigidity modulus of a cylindrical body by static torsion apparatus **CO4.** Determination of the co-efficient of viscosity of liquid by capillary tube method. **CO5.** Determination of the surface tension of a liquid by Jaeger's method. **CO6.** Determination of the frequency of a tuning fork by Melde's method. **CO7.** To verify the inverse square law in magnetism **CO8.** Determination of the resistance per unit length of the potentiometer wire by Carey-Foster method.

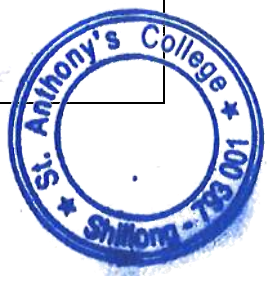
	CO9. Determination of the value of the capacitance of an unknown capacitor by using the de-Sauty's bridge.
SEMESTER-III	
Name of the Paper: Thermal Physics, Optics **Paper Code:** PHY03(T)	Upon completion of this course the students are expected to learn, understand and develop the concepts of **CO1.** Kinetic theory of gases and its applications. **CO2.** Transport phenomena in gases **CO3.** Laws of thermodynamics and their applications to understand different characteristics of gases **CO4.** Liquefaction of gases **CO5.** Theory of Black body radiation **CO6.** Theory of geometric optics and image formations **CO7.** Aberration in image formations **CO8.** Theory of Black body radiation **CO9.** Theory of Interference, diffraction and polarizaton **CO10.** Introductory theory of dispersion and scattering **CO11.** Introduction to lasers and fibre optics
Name of the Paper: Experimental Physics-II **Paper Code:** PHY03(P)	Upon completion of this paper, students will understand the theory and be able to perform the following experiments and apply the underlying principles to perform other such experiments. Also it should help them develop conceptual knowledge of the underlying theory through experiential learning. **CO1.** Determination of the co-efficient of linear expansion of a solid by using Pullinger's apparatus and optical lever. **CO2.** Determination of the specific heat of a liquid by the method of cooling. **CO3.** Determination of the co-efficient of thermal conductivity of a good

	conductor by Searle's method. **CO4.** Determine the mechanical equivalent of heat by Joule's calorimeter. **CO5.** Determination of the refractive index of a prism by a spectrometer using monochromatic light. **CO6.** Determination of the radius of curvature of a lens by Newton's ring method. **CO7.** Determination of the grating constant by using a spectrometer. **CO8.** Determine the wavelength of a laser beam using plane diffraction grating. **CO9.** Determination of the refractive index of the materials of convex lens by measuring its focal length (displacement method) and radii of curvature (using spherometer). **CO10.** To study the frequency response of a series and parallel LCR circuit
SEMESTER-IV	
Name of the Paper: Special Theory of Relativity, Quantum Mechanics –I, Atomic Physics-I, Nuclear Physics-I and Solid State Physics-I **Paper Code:**	Upon completion of this course the students are expected to learn, understand and develop the concepts of **CO1.** Basics of the theory of relativity **CO2.** Introductory to quantum mechanics and Schrodinger's equation **CO3.** Introductory Atomic Physics and Modern Physics **CO4.** Introductory Nuclear Physics – Radioactivity, properties of nucleus, Nuclear reactions **CO5.** Basic elementary particle Physics and Cosmic rays **CO6.** Introductory Solid State Physics - theory of crystals and their structure

PHY04(T)	**CO7.** Introductory theory of Superconductivity
Name of the Paper: Experimental Physics-III **Paper Code:** PHY04(P)	Upon completion of this course, students will understand the theory and be able to perform the following experiments and apply the underlying principles to perform other such experiments. Also it should help them develop conceptual knowledge of the underlying theory through experiential learning. **CO1.** Determination of the energy gap of a semiconductor diode. **CO2.** To study the characteristics of LDR, Photodiode **CO3.** Measurement of current in an external circuit by using Potentiometer. **CO4.** Use of a multimeter to measure the output voltages of half wave and full wave rectifiers and find the value of ripple factors. **CO5.** Determination of Planck's constant by photocell or by heating method. **CO6.** Determination of the specific charge (e/m) of an electron by magnetron/Thomson's method. **CO7.** Determination of the value of an unknown low resistance by using potentiometer. **CO8.** Determination of the emf of a battery by using potentiometer. **CO9.** Verification of Thevenin's theorem. **CO10.** Verification of Norton's theorem. **CO11.** Verification of Superposition theorem.
SEMESTER-V	
Name of the Paper: Mathematic Physics-II, Quantum	Upon completion of this course the students are expected to learn, understand and develop the concepts of **CO1.** Different coordinate systems and their inter relations ips

Mechanics-II **Paper Code:** PHY05(T-A)	**CO2.** Theory of matrices and their properties; Characteristic equations, Eigen vectors and Eigen Values **CO3.** Second order differential equations and their solutions **CO4.** Legendre and Hermite Polynomials **CO5.** Partial differential equations and their solutions **CO6.** Gamma and Beta functions and their properties **CO7.** Elementary tensor analysis **CO8.** Operator formalism of Quantum Mechanics **CO9.** Applications of time independent Schrodinger's equation **CO10.** Angular momentum operators in spherical polar coordinates **CO11.** Solution of Hydrogen problem using Schrodinger's equation in polar coordinates
Name of the Paper: Classical Mechanics, Electrodynamics, Statistical Physics, Energy Sources **Paper Code:** PHY05(T-B)	Upon completion of this course the students are expected to learn, understand and develop the concepts of **CO1.** Introductory Lagrangian and Hamiltonian formulation of Classical Mechanics **CO2.** Maxwell's Equations in vacuum and material media **CO3.** Electric field inside matter **CO4.** Boundary conditions satisfied by E and D at the interface between two homogeneous dielectrics **CO5.** Electromagnetic Potentials **CO6.** Electromagnetic waves, Poynting's theorem and Poynting Vector **CO7.** Thermodynamic relations **CO8.** Introductory statistical Mechanics **CO9.** Renewable energy sources

Name of the Paper: Experimental Physics-IV **Paper Code:** PHY05(P)	Upon completion of this course, students will understand the theory and be able to perform the following experiments and apply the underlying principles to perform other such experiments. Also it should help them develop conceptual knowledge of the underlying theory through experiential learning. **CO1.** Measurement of temperature by using a thermocouple. **CO2.** Determination of wavelength of the spectral lines of an element by using a plane diffraction grating and spectrometer. **CO3.** Determination of electrical conductivity of solid electrolyte by Kaulrauch method. **CO4.** Determination of the co-efficient of thermal conductivity of a bad conductor by Lee's method. **CO5.** Determination of the specific rotation of solution using polarimeter. **CO6.** Determination of Young's modulus (Y) of glass using Cornu's Method. **CO7.** Determine the refractive index of the material of a prism. **CO8.** To measure the width of single slit from the study of its Fraunhoffer diffraction. **CO9.** Determination of the wavelength of sodium light using biprism. **CO10.** Determination of the monochromatic wavelength by Michelson interferometer. **CO11.** Determination of the reduction factor of a tangent galvanometer and also the value of horizontal component of earth's magnetic field by electrolysis method. **CO12.** Determination the velocity of ultrasonic waves in liquid.



SEMESTER-VI	
Name of the Paper: Solid State Physics-II, Electronics-II and Fortran Programming **Paper Code:** PHY06(T-A)	Upon completion of this course the students are expected to learn, understand and develop the concepts of **CO1.** Crystal structures and their symmetry **CO2.** Theory of diffraction by crystals **CO3.** Bonding in Crystals **CO4.** Theory of Lattice vibrations **CO5.** Quantum mechanical treatment of free electrons in metals **CO6.** Introduction to band theory of solids **CO7.** Langevin theory of diamagnetism and paramagnetism **CO8.** Weiss theory of ferromagnetism; anti – ferromagnetism and ferri - magnetism **CO9.** Introductory theory of Superconductors **CO10.** FET, OPAMP, Amplifiers, and Oscillators **CO11.** Elements of communication systems, features of radio communication **CO12.** TTL Logic families, multiplexer, demultiplexer, digital comparator **CO13.** Fortran 77 programming language
Name of the Paper: Atomic Physics-II, Molecular Spectroscopy, Nuclear Physics –II, Astrophysics **Paper Code:**	Upon completion of this course the students are expected to learn, understand and develop the concepts of **CO1.** Vector atom model **CO2.** Zeeman effect – experiment and theory **CO3.** Theory of Alkali spectrum **CO4.** Two electrons system: L-S coupling, j-j coupling, Pauli's exclusion principle, spectra of helium atom and alkaline earth atoms, singlet and triplet fine structure, selection rules

PHY06(T-B)	**CO5.** Types of molecular spectra – rotational, vibrational and electronic spectra **CO6.** Quantum mechanical theory of rigid body rotator **CO7.** Electronic spectra: Electronic band systems, sequence and progression, Frank Condon principle **CO8.** Raman effect and its brief quantum mechanical explanation, **CO9.** Fundamental ideas of UV and IR spectroscopy **CO10.** Nucleus and its properties **CO11.** Binding energy of a nucleus and its variations **CO12.** Semi empirical Binding energy Formula **CO13.** Different Nuclear models **CO14.** Properties of nuclear forces, two nucleon system, square well solution of the deuteron problem **CO15.** Geiger – Nuttal law, Gamow's theory of α decay, Fermi's theory of β – decay **CO16.** Nuclear radiation and energy levels **CO17.** Biological effects of nuclear and electromagnetic radiations **CO18.** Nuclear Reactions and its energetics **CO19.** Nuclear Fission and the Bohr Wheeler theory of nuclear fission **CO20.** Four factor formula for a nuclear multiplication factor **CO21.** Nuclear reactors and its types **CO22.** Nuclear fusion and fusion in plasma, **CO23.** Tokamak experiment in fusion systems. **CO24.** Basic theory of Elementary Particles **CO25.** Fundamental interactions, forces and fields **CO26.** Symmetries and Conservation laws, Baryon and Lepton number conservation **CO27.** Resonant particles: discovery and important properties **CO28.** Gell-mann Nishijima scheme and the quark model **CO29.** Stellar evolution **CO30.** Spectral Classification of stars

	CO31. Star systems **CO32.** Solar cycles, its activity, Butterfly diagram and Photosphoric phenomena
Name of the Paper: Experimental Physics-V **Paper Code:** PHY06(P)	After completion of this paper, students will understand the theory and be able to perform the following experiments and apply the underlying principles to perform other such experiments. Also it should help them develop conceptual knowledge of the underlying theory through experiential learning. **CO1.** To study the a full wave rectifier **CO2.** To study the characteristics of a transistor in different configurations **CO3.** To study the characteristics of JFET. **CO4.** To design and study simple logic gates using ICs **CO5.** To study Lissajous figures using C.R.O. **CO6.** To study the frequency response of RC coupled amplifier. **CO7.** To write simple Fortran programs. **CO8.** Study the operation and characteristics of a GM counter.

Department of English

St. Anthony's College

Programme Specific Outcome

Graduates will be equipped to use their knowledge to pursue careers in the field of teaching, journalism, and writing.

Graduates will be able to use their text analytical and creative skills to meet the fast growing demands for these skills in the market.

Graduates will be able to meet the criteria to pursue their Masters in the subject or allied subjects.

Head
Dept. of English
Anthony's College
Shillong

Head of Department

Department of English

St. Anthony's College

Course Outcome

Course offered for students of Bachelor of Commerce will help the students to

I. Analyse the text as well as interpret and present their points of view in an articulate manner

II. Apply the techniques of writing through lessons in essay and precis writing

III. Apply the techniques of letter writing

IV. Apply the techniques of power point presentation

Head of Department

Programme Specific Outcome:

Graduates will be able to use their knowledge of English literature to pursue careers that require this knowledge
Graduates will be able to use their text analytical and creative skills to meet the fast growing demands for these skills
Graduates will be able to meet the criteria to pursue their Masters in the subject or allied subjects

Course Outcome:

Paper I: Will be able to describe and analyse the foundational literary work in the genre of poetry
Paper II: Will be able to trace the emergence of the novel as an art form thereby building their foundational knowledge as they go on to explore this evolving genre of literature in the later semesters
Paper III: Will able to trace and analyse the development of Drama as a genre from the Elizabethan period to the post-war era of the 20th century
Paper IV: Will be able to describe and discuss the necessary historical and social background knowledge required for the study of English literature
Paper V: Will be able to describe the major poets of the Romantic Movement in English poetry of the 19th century and explain the complexity of the Victorian period
Paper VI: Will be able to analyse the important work in the genre of fiction in the second half of the 19th century and first half of the 20th century
Paper VII: Will be able to analyse literary texts through the study of various literary theories and concepts
Paper VIII: Will be able to differentiate the pre and post-independence literary work in Indian Writing in English as well as discuss the historical and cultural context in India through the lens of the text

Course offered for students of Bachelor of Business Administration is divided into units. The students

Unit I: Will be able to write in certain styles, formulate arguments, present their thought and apply the techniques of persuasion
Unit II: Will be able to apply new vocabulary, sentence structures and narrative techniques besides also interpreting cultural, social and political elements as they appear in the text
Unit III: Will be able to analyse the poem
Unit IV: Will be able to apply the skills of communication

Course offered for students of Bachelor of Commerce will help the students to

I. **Analyse the text as well as interpret and discuss**
II. **Apply the techniques of writing through lessons in essay and precis writing**
III. **Apply the techniques of letter writing**
IV. **Apply the techniques of power point presentation**

Course offered for BSc will help students to:

I. **Analyse the text as well as interpret and discuss**

Course offered for Bachelor of Art General and Elective will help students to:

I. **Analyse and discuss the text and differentiate the various forms involved in poetry writing**

BACHELOR OF BUSINESS ADMINISTRATION

Programme Outcome

The three-year Graduate Course in Business Administration is a programme which will help and prepare our young people to be professionally trained personnel. The Programme has been tailored in such a way so as to expose the student to the functional areas of Business Administration such as Production and Operations Management, Organization Behaviour, Finance, Marketing, Economics and Human Resource Management.

The Programme is a blend of theory and practice which include case studies which can help the student analyse the different business situations and problems thus preparing a student to approach the real world with greater confidence. Furthermore, the programme intends to hone the managerial skills of a student to enable him or her to opt confidently for self-employment avenues, for which Entrepreneurship Development is an important component of the programme.

Programme Specific and Course Outcome

PSOs and COs for Business Administration Programme is one and the same as the course is very specific.

There is a total of 18 courses out of which 9 are Honours courses and the remaining 9 are core courses which are integral to the programme.

COMPULSORY COURSES (9 PAPERS)	HONOURS COURSES (9 PAPERS)
BBA C 101: ENGLISH FOR BUSINESS PURPOSE BBA C 102: QUANTITATIVE ANALYSIS BBA C 201: PRINCIPLES OF ECONOMICS BBA C 202: FINANCIAL ACCOUNTING BBA C 301: COST AND MANAGEMENT ACCOUNTING BBA C 401: BUSINESS ENVIRONMENT BBA C 402: PRODUCTION AND OPERATIONS MANAGEMENT BBA C 501: BUSINESS LAW COMMON PAPER: ENVIRONMENTAL STUDIES	BBA H 103: BUSINESS MANAGEMENT AND ORGANISATIONAL BEHAVIOUR BBA H 203: PRINCIPLES OF MARKETING BBA H 303: HUMAN RESOURCE MANAGEMENT BBA H 302: FINANCIAL MANAGEMENT BBA H 502: STRATEGIC MANAGEMENT BBA H 601: ENTREPRENEURSHIP AND PROJECT ANALYSIS **SPECIALIZATION GROUPS** **1. FINANCIAL MANAGEMENT GROUP** BBA H 403 [FM]: RISK MANAGEMENT AND INSURANCE BBA H 503 [FM]: FINANCIAL SERVICES AND DERIVATIVES BBA H 602 [FM]: PROJECT PLANNING AND CONTROL **2. HUMAN RESOURCE MANAGEMENT GROUP** BBA H 403 [HR]: HUMAN RESOURCE DEVELOPMENT BBA H 503 [HR]: COMPENSATION MANAGEMENT BBA H 602 [HR]: INDUSTRIAL RELATIONS AND LABOUR LAWS **3. MARKETING MANAGEMENT GROUP** BBA H 403 [MM]: CONSUMER BEHAVIOUR AND MARKETING RESEARCH BBA H 503 [MM]: SALES AND ADVERTISING MANAGEMENT BBA H 602 [MM]: SERVICES MARKETING

ENGLISH FOR BUSINESS PURPOSE:
The objectives of this course are firstly, to expose students to a selection of works of art that will appeal to their heart as well as to their mind. The second objective is to equip students with strategies such as critical thinking, language and vocabulary learning skills, interpretative techniques and a range of communication skills that will serve them in good stead in the future, academically and professionally.

QUANTITATIVE ANALYSIS
The objective of this course is to show how simple statistical methods can be applied to business situations so as to assist the manager in assessing the significance of the data available from external and internal sources and to develop in the students an ability to use mathematical and statistical methods to solve managerial problems.

BUSINESS MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR
The Objective of this course is to provide a broad overview of Management and Organizational behaviour (OB). The goals of this paper are threefold: to understand the various content areas (e.g., managerial functions, Individual behaviour like attitudes, personality, leadership, Group and team dynamics) in the OB field, to advance oral competencies through professional presentations and intra-class discussion/debate.

PRINCIPLES OF ECONOMICS
The objectives of this course are to introduce the student to the principles of economics which will aid them in the decision-making process at the organizational level.

FINANCIAL ACCOUNTING
The course is intended to be an introduction to accounting principles and procedures. This course is meant to enable the student to use and interpret all forms of accounts with knowledge of principles underlying the compilation of accounting statements and reports.

PRINCIPLES OF MARKETING
The Objective of this course is to introduce students to the concepts and principles of marketing and its applications.

COST AND MANAGEMENT ACCOUNTING
The Objective of this course is to help expose the students to the basic concepts and tools used in cost accounting.

FINANCIAL MANAGEMENT
The course focuses attention on formulating financial decisions in business enterprises with the object of developing in the student a skill for carrying out the functions of planning, raising, investing and controlling financial resources.

HUMAN RESOURCE MANAGEMENT
The Objective of this course is to provide a general understanding to the nature, concepts, principles and practices in human resource management.

BUSINESS ENVIRONMENT

The Objective of this course is to familiarize students with the Business environment and the organisation and functioning of various banks and non-bank institutions in the money and capital markets of India.

PRODUCTION AND OPERATIONS MANAGEMENT

Production/operations management involves the integration of numerous activities and processes to produce products and services in a highly competitive global environment. High performance in Production and operations, i.e., in product design, manufacturing, engineering and distribution, is essential in order to compete and survive in the long run.

This course considers the operations from a managerial perspective. It will help business students have a basic understanding of how the operations department functions and the interface between the operations department and the other departments of a business. In addition, they will also get to know about many of the tools and techniques used to manage a business' operation. The course will help to achieve the following objectives:

a) To acquaint students with Production and operations terminology and concepts.

b) To teach students how to analyze and understand situations from an operations perspective.

c) To familiarize students with different tools and techniques available to managers for directing the day-to-day operations of a business firm.

d) To assist students in understanding how the different functional areas interact and how that interaction ultimately affects the performance of the business.

RISK MANAGEMENT AND INSURANCE

The objective of this course is to acquaint the students with the various kinds of risks faced by individuals and business enterprises and to understand the role of insurance in managing those risks.

HUMAN RESOURCE DEVELOPMENT (HRD)

This course is aimed at familiarizing students with the need of HRD in the changing pattern of organizational requirements of human talent and understanding the linkage of HRD practice in planned change and development of organizations.

CONSUMER BEHAVIOUR & MARKETING RESEARCH

The objective of this course is to provide the students with a general understanding of consumer behaviour, its diversity and the role of marketing research assisting management decisions.

BUSINESS LAW

The objective of this course is to familiarize the student with Business Laws and its interpretation.

STRATEGIC MANAGEMENT

The objective of this course is to introduce students to the applications of Strategic Management which will enable them to develop appropriate Strategies for Small and Medium Business Enterprises.

FINANCIAL SERVICES AND DERIVATIVES
introduce the principles of financial services prevailing in the Indian markets and to expose the learners to contemporary ideas and concepts related to financial derivatives.

COMPENSATION MANAGEMENT The objective of this course is to
The course is aimed at familiarizing students with the basic issues involved in the compensation and to understand the critical role it plays in accelerating economic growth of employees and ensuring competitive performance for an organisation.

SALES AND ADVERTISING MANAGEMENT
The course is aimed to familiarize the students with the basic concepts, tools and techniques of advertising and sales.

ENTREPRENEURSHIP AND PROJECT ANALYSIS
The objective of this course is to promote the chances of entrepreneurial success and to develop an understanding of the roles of the entrepreneur with an ability to recognize the qualities required to these roles. It will also help students understand the concepts and process of entrepreneurship and industrial growth.

PROJECT PLANNING AND CONTROL
The course is aimed at providing the student with skills necessary to create, plan and control a new enterprise.

INDUSTRIAL RELATIONS AND LABOUR LAWS
The objective of this course is to develop an understanding of the interaction pattern among labour, management and the State and to build awareness of certain important and critical issues in Industrial Relations besides understanding legislations pertaining to industrial workers.

SERVICES MARKETING
The objective of this course is to familiarize the students with the concepts of Services Marketing, by revisiting the fundamental principles and application of Marketing, from a Services perspective.

M. Sc. BIOTECHNOLOGY

DEPARTMENT OF BIOTECHNOLOGY

PROGRAMME SPECIFIC OUTCOMES (PSOs)

After successful completion of the M. Sc. programme in Biotechnology students will:

PSO 1. Understand the fundamental concepts of biotechnology and allied disciplines.

PSO 2. Be able to design, conduct experiments, analyze and interpret data for investigating problems in biotechnology and allied fields.

PSO 3. Be able to pursue higher studies (M. Phil., Ph. D.) in order to attain research positions.

PSO 4. Be eligible and equipped for appearing in various examinations such as CSIR-NET, ARS-NET, GATE, ICMR, DBT and many others for promising careers in research.

PSO 5. Be qualified to work in entrepreneurship ventures such as consultancies and training centres, in pharmaceutical industries, drug and food processing companies, in marketing division for boosting company business and absorbed by institutions as teaching faculties.

PSO 6. Have an understanding of the potential and impact of biotechnological innovations and inventions on the environment, health sector, agriculture, etc., and hence can contribute on spreading awareness and finding sustainable solutions for implementation.

B. Sc. BIOTECHNOLOGY

DEPARTMENT OF BIOTECHNOLOGY

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Successful completion of the B. Sc. programme in Biotechnology will enable students to:

PSO 1. Understand the basic principles, practices and emerging concepts in Biotechnology, enabling their applications in industry, medicine and research.

PSO 2. Develop strong skills for the analysis and interpretation of problems and information in modern biology. Technical and laboratory hands-on training will be provided that will help the students excel in research and get better job opportunities.

PSO 3. Create awareness of the importance of ethics and IPR in research and industries. The students will be inculcated to adhere to ethical principles and to have a sense of responsibility.

PSO 4. Successfully compete in various exams and competitions at the national and international level.

B. Sc. BIOCHEMISTRY

DEPARTMENT OF BIOCHEMISTRY

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Successful completion of the B. Sc. programme in Biochemistry will enable students to:

PSO 1. Understand the nature and basic concepts of Biochemistry, their biomolecules and their techniques used.

PSO 2. Analyse the importance of thermodynamics, its membrane biophysical features and the need of statistical analyses in biology.

PSO 3. Have an in-depth understanding of proteins and the usefulness of enzymes in biochemistry.

PSO 4. Understand the nature and basic concepts of cell biology and physiology of prokaryotic and eukaryotic cells in plants, animals and microbes.

PSO 5. Explore the intermediary metabolism of all the biomolecules involved in living organisms for a clear concept in the basis of biochemistry.

PSO 6. Analyse the nutritional and clinical aspects of biomolecules in humans.

PSO 7. Understand the features, importance and basic concepts of molecular biology and its application.

M. Sc. BIOTECHNOLOGY

DEPARTMENT OF BIOTECHNOLOGY

COURSE OUTCOMES (COs)

SEMESTER I

Course: BIT C 101 – Cell Biology and Genetics (Theory)

After successful completion of the course, students will be able to:

CO 1. Understand the basic structure/function of cell organelles and organization and function of cell wall.

CO 2. Describe the mechanisms of electron transport system, oxidative phosphorylation and photophosphorylation.

CO 3. Describe the structure and composition of nucleus, mechanism of cell cycle and cell division.

CO 4. Understand cell signaling and mechanism of signal transduction in animal and *Rhizobium*-legume symbiosis.

CO 5. Understand microbial genetics with emphasis on different mechanisms of genetic transfer processes.

CO 6. Understand extranuclear inheritance by studying the maternal effects in snail coiling and mitochondrial genetic defects.

CO 7. Understand the basic concepts of human genetics, Mendelian pedigree pattern and polygenic inheritance.

CO 8. Understand chromosome abnormalities, genome instability and sex-determination.

Course: BIT C 102 – Biomolecules (Theory)

After successful completion of the course, students will be able to:

CO 1. Learn in detail the types of chemical bonds and the nature of interaction.

CO 2. Understand the law of thermodynamics in biological systems; relevance of Gibbs free energy, entropy and enthalpy.

CO 3. Learn in detail the structures, functions & applications of nucleotides, flavonoids, alkaloids, pigments, phenolic, terpenoids, carbohydrates, proteins and lipids.

CO 4. Understand the concept of secondary metabolites, its relevance & applications.

CO 5. Understand the concept of hetrocyclic compounds & its applications.

CO 6. Learn the conformational properties of biomolecules and the mathematical models to study protein folding.

CO 7. Describe the role of chaperones and chaperonins.

CO 8. Learn the basic principles and applications of important techniques for analyzing carbohydrate and protein.

Course: BIT C 103 – Microbiology (Theory)

After successful completion of the course, students will be able to:

CO 1. Describe the history of discovery of microorganisms, controversy over spontaneous generation, and interaction of microorganisms with the environment.

CO 2. Understand basic concepts of microbial nutrition and growth, construction and types of culture media, culture techniques, influence of environmental factors on growth and culture collection and its maintenance.

CO 3. Learn the metabolic diversity of microorganisms; photosynthesis, chemolithotrophy, hydrogen-iron-nitrite oxidation, nitrate and sulfate reduction, methanogenesis, acetogenesis, fermentation and nitrogen.

CO 4. Learn the physiological diversity of bacteria, archaea and eukarya.

CO 5. Learn the discovery and classification of viruses, cultivation, maintenance and handling practices.

CO 6. Learn microbial diseases and their methods and modes of transmission.

CO 7. Understand the interaction between parasites and their host, mechanism of virulence and pathogenesis.

CO 8. Describe the types of antimicrobial substances.

CO 9. Understand the mechanism of microbial resistance to antibiotics.

Course: BIT C 104 – Laboratory I (Practical)

Students will learn how to:

CO 1. Learn the principles and applications of bright field, phase contrast and fluorescence microscopy.

CO 2. Prepare subcellular fractionation of mitochondria and chloroplast.

CO 3. Prepare chromosome from mice bone marrow and root tip for examination of metaphase.

CO 4. Study meiosis in grasshopper tetstes and flower bud

CO 5. Study cell cycle from flow cytometry analysis

CO 6. Culture lymphocyte and prepare chromosome from human.

CO 7. Perform human karyotyping from well spread metaphase photograph.

CO 8. Perform quantitative reactions of amino acids, sugars, proteins and nucleic acids.

CO 9. Perform microscopic examination of microorganisms and effects of environmental factors on bacterial growth.

CO 10. Isolate and culture microorganisms and perform antibiotic assay.

CO 11. Study sister chromatid exchanges and chromosomal aberrations.

SEMESTER II

Course: BIT C 201 – Molecular Biology (Theory)

After successful completion of the course, students will be able to:

CO 1. Describe the detail structure of DNA and its physico-chemical properties.

CO 2. Understand the important aspects of eukaryotic and prokaryotic replication, transcription, post transcriptional modification, translation and repair of DNA damage.

CO 3. Learn the salient features of genetic code, regulation of prokaryotic and eukaryotic gene expression and translation.

CO 4. Learn the underlying mechanisms of base and nucleotide excision repair, mismatch repair and DNA double strand break repair.

CO 5. Understand the inducible and repressible regulation of prokaryotic gene expression.

CO 6. Understand the regulatory mechanisms of chromatin remodeling in eukaryotes.

CO 7. Understand the importance of epigenetics and regulatory RNAs.

CO 8. Learn the importance of human genome projects, structural genomics, functional genomics and analysis of knock-out mutants.

Course: BIT C 202 – Immunology (Theory)

After successful completion of the course, students will be able to:

CO 1. Understand the basic concepts of immune responses, classification and types of immune responses and structure/organization of lymphoid organs.

CO 2. Understand the concepts of immunogens, antigens ,haptens&adjuvents and their roles in immune response

CO 3. Learn the nature and biology of T-dependent, T-independent and superantigens.

CO 4. Understand the antigen-antibody interaction and MHC structure and function.

CO 5. Understand the mechanism of activation of T & B lymphocytes and their role in the regulation of immune system.

CO 6. Understand the role of cytokines and MHC restriction.

CO 7. In depth understanding of autoimmunity, hypersensitivity, immunomodulation: - its mechanisms and significance.

CO 8. Understand the complement system and its pathways-Regulation & applications

CO 9. Understand the mechanism of immune response to microbes and pathogens.

CO 10. Understand the mechanism of immunity to tumor and the development, problem and prospect of vaccines against AIDS, cancer and malaria.

Course: BIT C 203 – Laboratory II (Practicals)

Students will learn how to:

CO 1. Extract genomic DNA and RNA.

CO 2. Study semi-conservative replication in mammalian cells

CO 3. Perform polymerase chain reaction (PCR) of human/mouse genomic DNA.

CO 4. Perform agarose gel electrophoresis of DNA.

CO 5. Perform restriction endonuclease digestion of DNA.

CO 6. Separate mononuclear cells by Histopaque.

CO 7. Isolate and identify macrophages.

CO 8. Count WBCs.

CO 9. Raise antiserum in mouse/rabbit and perform immunodiffusion in agar gels.

CO 10. Study antigen-antibody interaction in *in vitro* double immunodiffusion.

CO 11. Perform ELISA.

CO 12. Staining of splenocytes with antibodies and flow cytometric analysis.

Course: BIT O 204 – Microbial Technology (Theory)

After successful completion of the course, students will be able to:

CO 1. Explain the mechanism to regulate and manipulate gene expression in prokaryotes.

CO 2. Learn the techniques to increase protein expression in *E. coli.*

CO 3. Describe the construction of plasmids, antibiotic resistance and their role in *E. coli* transformation.

CO 4. Explain the mode of synthesis and significance of polysaccharides, steroids and sterols produced by microorganisms.

CO 5. Describe the roles of microorganisms in waste management and industrial production of food and beverages.

CO 6. Explain the metabolic pathways of microbial production of amino acids, antibiotics, enzymes, and organic acids.

CO 7. Describe the methods for strain selection, improvement, preservation and production of probiotics.

CO 8. Explain the role of microorganisms in farm animals and transgenic plants.

CO 9. Describe the diagnostic and clinical methods for infectious diseases.

CO 10. Understand endophytes and their role in novel metabolite production.

Course: BIT O 205 – Microbial Technology (Laboratory Work)

Students will learn how to:

CO 1. Enumerate microbial population.

CO 2. Identify unknown bacteria.

CO 3. Isolate genomic DNA from *E. coli.*

CO 4. Perform polymerase chain reaction (PCR) of bacterial DNA.

CO 5. Perform electrophoretic separation of bacterial DNA in agarose gel.

CO 6. Produce alcohol, citric acid, amylase and antibiotics from microorganisms.

SEMESTER III

Course: BIT C 301 – Computer applications, Bioinformatics & Biostatistics (Theory)

After successful completion of the course, students will be able to:

CO 1. Describe the role of computer applications in bioinformatics.

CO 2. Classify the different types of biological database with examples

CO 3. State the importance of using a database.

CO 4. Explain the different types of nucleotide databases.

CO 5. Explain the different types of protein databases.

CO 6. Explain the different types of protein structure databases.

CO 7. Define sequence alignment and classify the different types of sequence alignment.

CO 8. Explain the sequence alignment algorithm – Dot matrix analysis, pairwise alignment using dynamics programming and Bayesian method.

CO 9. Differentiate between local alignment and global alignment.

CO 10. Differentiate between pairwise alignment and multiple sequence alignment.

CO 11. Explain the different types of BLAST programs and its applications.

CO 12. Explain the different types of FASTA programs and its applications.

CO 13. Differentiate between BLAST and FASTA programs.

CO 14. Differentiate between motifs and domains.

CO 15. Define regulatory networks and its concept.

CO 16. Define phylogenetic analysis and its application in evolutionary relationships.

CO 17. Differentiate and explain the tree building methods – UPGMA, NJ, Maximum Parsimony, Maximum Likelihood and Bayesian inference.

CO 18. Explain how bootstrap provides a confidence limit in building a phylogenetic tree.

CO 19. Explain comparative genome analysis.

CO 20. Explain how metabolic pathway of newly sequenced genome is constructed.

CO 21. Describe the computational tools are used for expression analysis.

CO 22. Define drug designing and explain the computational steps involved in drug design.

CO 23. Define molecular docking and explain the different docking algorithms and scoring function.

CO 24. Explain QSAR and its importance in structure – activity relationship.

CO 25. Explain the methods used to build 2D and 3D QSAR models.

CO 26. Explain the different advances in QSAR – GQSAR, 3D, 4D, 5D and 6D.

CO 27. Define homology modelling and explain the steps involved in modelling a three-dimensional structure of a protein.

CO 28. Explain energy minimisation and state its importance.

CO 29. Explain molecular dynamics simulation and why it is important.

CO 30. Explain the applications of molecular dynamics simulation in biomolecules.

CO 31. Define computer networks and elaborate the different topologies of computer networks with examples.

CO 32. Describe the basics of the different computer operation system – Windows, Linux and MacOS.

CO 33. Describe the various characteristics and attributes of HTML.

CO 34. Create a web page using suitable HTML tags.

CO 35. Explain the basic concept of PERL programming.

CO 36. Describe the applications of PERL programming in biological data.

CO 37. Explain the basic concept of SQL.

CO 38. Explain the importance of SQL in creating a database.

CO 39. Describe and calculate mean, median, mode, range, standard deviation and variance.

CO 40. Calculate the level of significance of the tabulated data.

CO 41. Describe and calculate the statistical significance using F and t test.

CO 42. Describe and calculate Chi – square test.

CO 43. Describe and calculate linear regression and correlation.

CO 44. Describe and calculate the probability tests using – random experiment, sample point, sample space, exclusive and exhaustive events.

Course: BIT C 302 – Genetic Engineering and Plant Biotechnology (Theory)

After successful completion of the course, students will be able to:

CO 1. Explain the modes of action and applications of restriction enzymes and modifying enzymes.

CO 2. Understand the features of cloning vectors and their role in recombinant DNA cloning.

CO 3. Describe molecular techniques such as S1 mapping, RNase protection assay and reporter assay.

CO 4. Describe the strategies to express heterologous genes in bacteria, yeast, mammalian and plant cells.

CO 5. Describe high throughput sequencing technique, creation of knock-out mutations and functional proteomics and genomics of yeast and *Arabidopsis*.

CO 6. Explain the basic concept of totipotency in plants, plant regeneration methods, culture methods, micropropagation, and acclimatization.

CO 7. Describe anther culture, embryo culture, embryo rescue and conservation of plant resources.

CO 8. Describe the role of DNA markers.

CO 9. Describe the transformation methods in plants, monocots and chloroplast.

CO 10. Understand the benefits of transgenic plants in fruit yield and performance under biotic and abiotic stresses.

CO 11. Understand the basic rights of breeders and farmers.

Course: BIT C 303 – Laboratory – III (Practicals)

Students will learn how to:

CO 1. Isolate plamid DNA.

CO 2. Perform polymerase chain reaction (PCR) of plant DNA.

CO 3. Perform DNA restriction digestion and agarose gel electrophoresis.

CO 4. Prepare competent cells and perform bacterial transformation.

CO 5. Propagate callus and organogenesis.

CO 6. Perform anther culture for the production haploid plants.

CO 7. To retrieve a nucleotide sequence and a protein sequence from NCBI

CO 8. To retrieve a research article from NCBI PubMed

CO 9. To perform NCBI BLAST to search for similar sequences based on homology.

CO 10. To retrieve a nucleotide sequence from DDBJ

CO 11. To retrieve a protein sequence from Swissprot/Uniprot

CO 12. To retrieve a biological pathway from KEGG

CO 13. To retrieve a protein structure and analyse using Rasmol

CO 14. To perform a multiple sequence alignment using Clustal Omega

CO 15. Perform statistical analysis of biological data.

Course: BIT O 304 – Applied Molecular Genetics (Theory)

After successful completion of the course, students will be able to:

CO 1. Explain the mechanism of protein-DNA interaction and regulation of transcription and translation.

CO 2. Describe gene silencing and gene therapy.

CO 3. Learn the molecular diagnosis of cancer and cell cycle control.

CO 4. Understand gene expression and the formation of fruiting body in *Dictyostellium*.

CO 5. Learn the different prenatal diagnosis techniques and their significance.

CO 6. Learn the role of hox genes in body pattern in *Drosophila* and humans.

CO 7. Understand the developmental biology of root, shoot, flower development and seed formation.

CO 8. Understand about genetic disorders in haemoglobin and learn the types of mutations and structural defects of enzymes and proteins.

CO 9. Learn about the genes involved in neurodegenerative disorders in humans.

CO 10. Understand the genetic basis of plant-pathogen interactions and the role of R genes.

CO 11. Understand genome projects of *Saccharomyces cerevisiae, Schizosaccharomyces pombe,Candida albicans,Caenorhabditis elegans, Arabidopsis thaliana* and *Oriza sativa*.

CO 12. Learn about genome instability: molecular causes and their mechanisms.

CO 13. Understand molecular cytogenetic techniques and their applications: chromosome banding, chromosome painting, FISH, GISH and CGH-analysis.

Course: BIT O 305 – Applied Molecular Genetics (Laboratory Work)

Students will learn how to:

CO 1. Perform polymerase chain reaction (PCR) of DNA repair/tumor suppressor genes.

CO 2. Perform reverse-transcription polymerase chain reaction (RT-PCR).

CO 3. Perform western blot of regulatory protein of cell cycle/apoptosis.

CO 4. Prepare metaphase chromosomes from cultured lymphocytes and cell lines.

CO 5. Determine genetic fidelity of tissue culture plants with RAPD markers.

Course: BIT O 306 – Bioinformatics in Molecular and Cell Biology (Theory)

After successful completion of the course, students will be able to:

CO 1. Explain the role of computer applications in bioinformatics.

CO 2. Classify the different types of biological database with examples

CO 3. State the importance of using a database.

CO 4. Explain the different types of nucleotide databases.

CO 5. Explain the different types of protein databases.

CO 6. Explain the different types of protein structure databases.

CO 7. Define sequence alignment and classify the different types of sequence alignment.

CO 8. Explain the sequence alignment algorithm – Dot matrix analysis, pairwise alignment using dynamics programming and Bayesian method.

CO 9. Differentiate between local alignment and global alignment.

CO 10. Differentiate between pairwise alignment and multiple sequence alignment.

CO 11. Explain the different types of BLAST programs and its applications.

CO 12. Explain the different types of FASTA programs and its applications.

CO 13. Differentiate between BLAST and FASTA programs.

CO 14. Explain the statistical importance of sequence alignments.

CO 15. Explain how insertions and deletions affect the alignment of the sequences.

CO 16. Explain how a gene is predicted using different methods.

CO 17. Explain how repetitive elements are detected in a DNA sequence using CENSOR program.

CO 18. Describe the detection of functional sites in DNA sequence using PromoterScan.

CO 19. Understand concept of functional SNPs and explain how they are identified using in silico analysis.

CO 20. Explain the different methods and computational tools used for analysis of functional SNPs.

CO 21. Understand a scoring matrix and describe the various protein scoring matrices.

CO 22. Elaborate the use of the scoring matrices when two protein sequences are aligned.

CO 23. Differentiate between PAM and BLOSUM and elaborate on its types.

CO 24. Explain how a domain pattern is detected using different computational tools – PROSITE, BLOCKS and PRINTS.

CO 25. Differentiate between motifs and domains.

CO 26. Enumerate the significance of DNA – protein interaction.

CO 27. Explain the methods used to evaluate DNA – protein interaction.

CO 28. Enumerate the significance of protein – ligand interaction.

CO 29. Explain theexperimental methods used to evaluate protein – ligand interaction.

CO 30. Define drug designing and explain the computational steps involved in drug design.

CO 31. Define molecular docking and explain the different docking algorithms and scoring function.

CO 32. Explain Bragg's Law with example.

CO 33. Explain the steps in X – ray crystallography of proteins.

CO 34. Describe the ideal characteristics of a protein crystal.

CO 35. Define PDB. Explain how protein structures stored in PDB.

CO 36. Explain the insilico approach to classify a protein structure using CATH and SCOP.

CO 37. Explain pairwise alignment of protein structures using DALI.

CO 38. Explain how protein structure is aligned to sequences of homologues and a sequence profile characteristic of the family using HSSP.

CO 39. Explain the computational methods to study interactomes.

CO 40. Explain the methods used to evaluate protein – protein interaction.

CO 41. Explain how secondary structures of a protein sequence are predicted.

CO 42. Explain in details the different secondary structures prediction methods.

CO 43. Explain how charge and hydrophobicity profile help in identifying a transmembrane segment.

CO 44. Explain how transmembrane segments in a protein sequence are predicted using computational tools.

CO 45. Explain how protein structures are analysed and summaries using PDBsum

CO 46. Define molecular markers and explain how they are used to analyse genetic diversity.

CO 47. Define SNP genotyping and discuss the hybridisation based method.

CO 48. Define VNTRs and explain in details.

CO 49. Define 23SrRNA.

CO 50. Explain the methodology and applications of AFLP.

CO 51. Explain the methodology and applications of RAPD.

CO 52. Define microarray and explain in details.

CO 53. Describe the factors affecting microarray data.

CO 54. Enumerate the problems that may appear with microarray.

CO 55. Define ESTs and explain in details.

CO 56: Understand the concepts of molecular markers and types.

CO 57. Learn the molecular tools (microarray, transcriptome, expressed sequence tags) to analyze gene expression.

CO 58. Understand the mechanism of transcription regulation.

Course: BIT O 307 – Bioinformatics in Molecular and Cell Biology (Practicals)

Students will learn how to:

CO 1. Retrieve a nucleotide and a protein sequence from NCBI.

CO 2. Retrieve a research article from NCBI PubMed.

CO 3. Perform NCBI BLAST to search for similar sequences based on homology.

CO 4. Retrieve a nucleotide sequence from DDBJ.

CO 5. Retrieve a protein sequence from Swissprot/Uniprot.

CO 6. Retrieve a biological pathway from KEGG.

CO 7. Retrieve a protein structure and analyse using Rasmol.

CO 8. Perform a multiple sequence alignment using Clustal Omega.

CO 9. Retrieve information from TAIR database for *Arabidopsis thaliana.*

CO 10. Predict a transmembrane region of a protein sequence using TMHMM.

CO 11. Search for a protein family and domain using ScanProsite.

CO 12. Classify a protein structure using CATH.

CO 13. Classify a protein structure using SCOP.

CO 14. Analyse the DNA sequence for restriction enzymes using NEB cutter.

CO 15. Search and predict a gene sequence from a DNA sequence using GenScan.

CO 16. Search and predict PCR primers for a DNA sequence using Primer 3.

CO 17. Visualise genome maps using NCBI viewer.

SEMESTER IV

Course: BIT C 401 – Animal Science and basic Enzymology (Theory)

After successful completion of the course, students will be able to:

CO 1. Explain the basic concepts of animal cell structure and organization.

CO 2. Explain the concept of cell lines and types.

CO 3. Describe the composition of culture media and the chemical, physical and metabolic functions of the media constituents.

CO 4. Describe the basic techniques of *in vitro* mammalian cell culture, maintenance, cell synchronization, growth parameters, cell viability measurement and cytotoxicity.

CO 5. Understand the concepts of organ and histotypic cultures.

CO 6. Learn about the techniques of cell cloning, micromanipulation and transformation.

CO 7. Describe the applications of animal cell culture, stem cell culture, embryonic culture and cell culture based vaccines.

CO 8. Understand interspecific somatic cell genetics and application in human chromosome mapping.

CO 9. Understand the concept of system biology and the application of computational biology approaches to digestive, respiratory, nervous and circulatory systems.

CO 10. Learn enzymes: classification, properties and denaturation.

CO 11. Explain the mechanism of enzyme action and energetic of enzyme catalyzed reactions.

CO 12. Understand the regulatory role of isoenzymes, co-factors and co-enzymes.

CO 13. Learn enzyme kinetics and the derivation of Michaelis-Menten equation.

CO 14. Explain the significance of Vmax, Kcat and enzyme inhibition.

CO 15. Learn about ribozymes, catalytic antibodies, multienzyme systems and their applications.

Course: BIT C 402 – Bioprocess Engineering and Technology (Theory)

After successful completion of the course, students will be able to:

CO 1. Describe the techniques to isolate, preserve and maintain the industrial microorganisms.

CO 2. Describe important aspects of microbial cultures: kinetics of growth and death, biomass estimation, open/closed system and product formation.

CO 3. Describe the different types of bioreactors and analysis of the reactions, microbial populations and reactor stability.

CO 4. Explain the working principle of bioreactor and the control parameters for the reaction and management of substrates and products.

CO 5. Explain the importance of enzyme and cell immobilization.

CO 6. Describe the role of microorganisms in mineral beneficiation and oil recovery.

CO 7. Understand the essential biosynthetic pathways for production of alcohols (ethanol), acids (citric, acetic and gluconic), solvents (glycerol, acetone, butanol), antibiotics (penicillin, streptomycin and tetracycline) and amino acids (lysine and glutamic acid).

CO 8. Describe the basic procedure of canning and packing of food products.

CO 9. Explain food preservation processes such as sterilization and pasteurization.

CO 10. Describe fermented foods and probiotics.

Course: BIT C 403 – Environmental Biotechnology, IPR, Biosafety and Bioentrepreneurship (Theory)

After successful completion of the course, students will be able to:

CO 1. Understand the concepts, structure and function of environment, ecology and ecosystems.

CO 2. Explain the damages caused to the environment by soil/air/water pollution, ozone depletion, green house gases and land degradation.

CO 3. Describe the importance of genetically modified microorganisms (GEMs) in the environment.

CO 4. Understand the process of remediation and its types.

CO 5. Describe microbial treatment of contaminated ground water, phytoremediation of soil metals and microbial degradation of xenobiotics.

CO 6. Describe the techniques to assess, treat and manage of sewage and waste water.

CO 7. Explain the role of microorganisms in the control of air pollution and production of biofuels.

CO 8. Learn about Biosafety and its relevance.

CO 9. Describe the terms GMOs, LMOs and their significance and relevance in the field of research.

CO 10. Understand in detail the concepts of containment, Risk and hazard: Its significance in the field of Recombinant DNA research.

CO 11. Understand the concept and types of IPR; should be able to draft an IP.

CO 12. Analyse various types of IP.

CO 13. Understand bioentrepreneurship: ventures, financial assistance, budget planning and cash flow management.

CO 14. Describe the basic features of accounting practices: assessment of market demand, market conditions, prediction of market changes, market linkages and distribution channels.

Course: BIT C 404 – Laboratory – IV (Practicals)

Students will learn how to:

CO 1. Perform trypsinization of monolayer and subculturing.

CO 2. Perform cryopreservation and thawing of cell lines.

CO 3. Prepare metaphase chromosomes from cultured cell.

CO 4. Isolate industrially important microorganisms.

CO 5. Determine thermal death point (TDP) and thermal death time (TDT) microorganisms required for the design of a sterilizer.

CO 6. Determine Km and Vmax of urease/arginase activity by by M. M. and L. B. plots respectively.

CO 7. Determine Ki of urease/arginase by M. M. and L. B. plots respectively.

CO 8. (a) Determine growth rate of a given microorganism and to determine substrate degradation profile.

(b) Compute specific growth rate (m) and growth yield (Yx/s) from (a).

CO 9. Determine and compare the production of ethanol by using different substrates.

CO 10. Produce and assay alkaline protease.

CO 11. Detect coliforms and determine the purity of potable water.

CO 12. Determine dissolved oxygen concentration of water sample by Winkler's method.

CO 13. Determine the biological oxygen demand (BOD) and chemical oxygen demand (COD) of sewage water.

CO 14. Test aromatic degradation of hydrocarbons by bacteria.

CO 15. Estimate nitrate in drinking water.

CO 16. Field/study tour report submission (visits to Biotechnology department, institute and industrial firms).

B. Sc. BIOTECHNOLOGY

DEPARTMENT OF BIOTECHNOLOGY

COURSE OUTCOMES (COs)

SEMESTER I

Course: Paper I T – Cell Biology and Genetics (Theory)

After successful completion of the course, students will be able to:

CO 1. Define and understand the functions of a cell and its organelles.

CO 2. Learn about the contributors of the Cell Theory.

CO 3. Describe the different theories of origin of life.

CO 4. Understand the development of the first cell and the evolution of metabolism.

CO 5. Describe the structure, composition and general functions of the various parts of a cell.

CO 6. Learn about the shape and structure of different chromosome types with diagrams.

CO 7. Understand the role of sex chromosome in sex determination.

CO 8. Learn about cell cycle and their different checkpoints, mitosis and meiosis

CO 9. Learn the basic concepts of genetics and terminologies, Mendel's experiments and the deviations.

CO10. Understand multiple alleles, multifactorial inheritance, types of gene interactions with examples.

CO 11. Learn about genetic linkage and linked genes, coupling and repulsion theory, and cis and trans configuration.

CO12. Compare crossing over and genetic recombination, and calculate recombination frequency, genetic distance and linear order of the genes.

CO 13. Learn the basic concepts of cytoplasmic inheritance (infective particles inheritance in *Paramecium.*

CO 14. Understand maternal inheritance and its effect on shell coiling in *Lymnaea*.

CO 15. Classify and describethe various types of mutations with examples.

CO 16. Learn about the isolation of auxotrophic, conditional and resistant bacterial mutants.

CO 17. Describe the methods for the detection of recessive mutations in the autosomes and X chromosomes of *Drosophila*.

CO 18. Learn about human genetics, human pedigrees and inheritance pattern of genetic disorders in humans.

Course: Paper I P – Laboratory

The students will learn how to:

CO 1. Prepare and study the mitotic stages from onion root tip cells.

CO 2. Prepare and study the different stages of meiosis in male grasshopper.

CO 3. Prepare polytene chromosomes in Dipteran larvae.

CO 4. Extract mitochondria and chloroplast.

CO 5. Prepare human karyotyping usinga photograph of a randomly scattered human metaphase spread.

SEMESTER II

Course: Paper II T – Biological Chemistry (Theory)

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

CO 1. Learn about composition of matter, ionisation of water, pH, pK and buffer systems.

CO 2. Derive the Hendersen-Hesselbach equation.

CO 3. Understand the concepts of entropy, free energy, electrical properties of biological components, electro-chemical gradients, membrane potential and chemiosmotic hypothesis.

CO 4. Classify and learn the structures of carbohydrates, amino acids, proteins and fats.

CO 5. Understand oxidative phosphorylation and the mechanism of ATP synthesis.

CO 6. Describe the electron transport chain in bacteria, plants and animals.

CO 7. Learn the basic concepts of metabolism and the terminologies.

CO 8. Describe glucose and glycogen breakdown, synthesis and their regulation.

CO 9. Learn about the diseases involved with deficiency of hormones in regulation on blood glucose level.

CO 10. Learn about fermentation, pentose phosphate pathway and fatty acid breakdown and generation of ATP.

CO 11. Describe CO_2-fixation, C-reduction cycles and photorespiration.

CO 12. Classify enzymes and learn about their and nomenclature.

CO 13. Understand the role of enzymes in catalysis, enzyme kinetics and its regulation.

CO 14. Learn how to isolate and purify enzymes.

Course: Paper II P – Laboratory

The students will learn how to:

CO 1. Prepare buffers.

CO 2. Estimate proteins, carbohydrates and lipids.

CO 3. Perform paper chromatography of amino acids.

CO 4. Determine the K_m and V_{max} of salivary amylase.

SEMESTER III

Course: Paper III T- Biostatistics and Biological Techniques (Theory)

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

CO 1. Understand the concepts of biostatistics, sample and population, collection of data and sampling techniques.

CO 2. Learn about processing and presentation of data.

CO 3. Learn the applications, merits and demerits of measures of central tendency and measures of dispersion.

CO 4. Understand the concepts of probability and conditional probability, correlation and regression analysis.

CO 5. Understand different types of theoretical distributions and their properties.

CO 6. Learn the meaning of significance, hypothesis testing and student's t-test.

CO 7. Understand the basics, working principles, types and applications of microscopy, colorimetry, spectrophotometry, fluorimetry, chromatography, electrophoresis, electrofocussing and centrifugation.

CO 8. Learn about nucleic acid hybridization, FISH, PCR, Southern blot, northern blot, western blot and ELISA.

Course: Paper III P – Laboratory

The students will learn how to:

CO 1. Verify Beer-Lambert's law

CO 2. Understand the parts and working principles of simple, compound, phase contrast and fluorescence microscope.

CO 3. Perform paper chromatography of carbohydrates.

CO 4. Estimate ascorbic acid.

CO 5. Quantify DNA using spectrophotometer.

CO 6. Calculate mean, standard deviation, frequency distribution, Chi-square test, and student's t-test for paired data.

SEMESTER IV

Course: Paper IV T – Molecular Biology and Immunology (Theory)

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

CO 1. Learn about the DNA and RNA structures and their roles.

CO 2. Describe the features of genome of virus, prokaryotes, and eukaryotes.

CO 3. Understand melting temperature and buoyant density of DNA and its relationship with DNA content.

CO 4. Learn about semiconservative DNA replication and the Meselson-Stahl experiment.

CO 5. Understand and compare the mechanism of DNA replication in prokaryotes and eukaryotes.

CO 6. Understand and compare the mechanism of transcription in prokaryotes and eukaryotes.

CO 7. Learn about reverse transcriptase and reverse transcription.

CO 8. Understand eukaryotic post-transcriptional processing of RNA

CO 9. Understand the genetic code and its properties.

CO 10. Understand the mechanism of translation in prokaryotes.

CO 11. Learn about the regulation of gene expression in prokaryotes.

CO 12. Understand the concept of immunology, innate, adaptive immunity, active and passive immunity.

CO 13. Learn about cells, organs and other components of the immune system.

CO 14. Learn about immunogens, antigens, haptens and adjuvents and their roles in immune response.

CO 15. Describe the structure and functions of antibody and its types.

CO 16. Learn about monoclonal antibody production and its application.

CO 17. Understand the antigen-antibody interactions and its applications.

CO 18. Describe antigen processing presenting pathways.

CO 19. Describe the complement system and its activation.

Course: Paper IV P – Laboratory

The students will learn how to:

CO 1. Isolate genomic DNA, followed by its quantification and ascertaining its purity.

CO 2. Perform agarose gel electrophoresis of the isolated DNA.

CO 3. Determine the T_m of DNA.

CO 4. Prepare a blood smear and identify leucocytes.

CO 5. Study antigen-antibody specificity by ODD.

CO 6. Determine their blood group (ABO blood grouping).

SEMESTER V

Course: Paper V T – Recombinant DNA technology (Theory)

After successful completion of the course, students will be able to:

CO 1. Understand the safety measures in rDNA technology and biosafety levels.

CO 2. Learn about major events in the development of rDNA technology.

CO 3. Learn abouthost cells - *Escherichia coli*strains, *Saccharomyces cerevisiae, Aspergillus,*mammalian cell lines - their nomenclature and general properties.

CO 4. Learn about the tools and techniques in rDNA technology.

CO 5. Learn about the different types of vectors and their applications.

CO 6. Describe the production of define DNA fragments, insertion of DNA into a vector and detection of recombinants.

CO 7. Understand gene cloning and expression in prokaryotic and eukaryotic systems.

CO 8. Describe the methods of gene delivery in plants and animals.

CO 9. Describe different transgenic organisms, the methods for creating them, their advantages and disadvantages, the ethics involved and the latest developments.

CO 10. Learn about the types of gene therapy, advantages, disadvantages and recent developments in the field.

Course: Paper V P – Laboratory

The students will learn how to:

CO 1. Isolate plasmid DNA, followed by its quantification.

CO 2. Perform agarose gel electrophoresis of the isolated plasmid DNA.

CO 3. Perform restriction digestion of bacteriophage λ DNA using Hind III enzyme, followed by agarose gel electrophoresis.

CO 4. Perform polymerase chain reaction (PCR), followed by analysis of the amplicons.

Course: Paper VI T – Microbiology and Environmental Biotechnology (Theory)

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

CO 1. Learn about the history and development of microbiology.

CO 2. Learn about the concepts and methods of sterilization.

CO 3. Learn about microbial growth curve and the factors affecting microbial growth.

CO 4. Describe and nutritionally classify the various forms of microorganisms.

CO 5. Learn about the isolation of microorganisms and pure culture techniques.

CO 6. Understand spontaneous and induced variations in microbial populations.

CO 7. Describe genetic recombination in microbes and strain improvement.

CO 8. Learn about symbiosis, antibiosis and N-fixation.

CO 9. Learn about modern fuels and their environmental impacts.

CO 10. Understand treatment of waste and effluents, and degradation of pesticides and toxic chemicals.

CO 11. Learn about limiting factors of the environment, energy transfer and biochemical cycling.

CO 12. Learn about environmental problems, GEMS in the environment and biopesticides.

CO 13. Learn about the bio-assessment of environment quality.

CO 14. Understand the role of the biotechnology in management of environmental problems.

Course: Paper VI P – Laboratory

The students will learn how to:

CO 1. Prepare media, cotton plugs and sterilization.

CO 2. Isolate microorganisms from water and soil samples.

CO 3. Isolate pure cultures by colony streaking and pour plate methods.

CO 4. Perform antibiotic sensitivity test.

CO 5. Perform Gram staining.

CO 6. Perform BOD and COD.

SEMESTER VI

Course: Paper VII T – Animal and Plant Biotechnology (Theory)

After successful completion of the course, students will be able to:

CO 1. Identify the four primary tissue types and discuss the structure, relevant features and function of each.

CO 2. Identify the various types of tissue membranes and the unique qualities of each.

CO 3. Understand the basic concepts in animal cell culture.

CO 4. List and explain the different ways in which a cell line can become established.

CO 5. Learn about stem cells and their applications.

CO 6. Understand tissue engineering and *in vitro* fertilization.

CO 7. Learn about Dolly the cloned sheep and the importance of cloning.

CO 8. Understand the problems and ethics in genetic engineering.

CO 9. Learn about the scope and history of plant biotechnology.

CO 10. Describe plant tissue culture tools and techniques, culture media, sterilization, callus and suspension cultures.

CO 11. Learn about embryogenesis, organogenesis and different modes of plant regeneration.

CO 12. Describe the methods employed for production of haploid plants.

CO 13. Learn about micropropagation of elite species.

CO 14. Explain the various methods of protoplast isolation, fusion and regeneration.

CO 15. Learn about the different methods to test the genetic fidelity of tissue culture raised plants.

CO 16. Learn about marker-assisted selection.

CO 17. Describe the production of transgenic plants with success stories.

CO 18. Understand intellectual property rights (IPR) and related issues.

Course: Paper VII P – Laboratory

The students will learn how to:

CO 1. Prepare media, culture animal cells and maintain them.

CO 2. Prepare plant culture media, initiate and maintain callus.

CO 3. Perform micropropagation of ornamental plants by auxillary bud proliferation.

Course: Paper VIII T – Genomics, Proteomics and Computer Application

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

CO 1. Learn about the objectives, goals and findings of the Human Genome Project and the *Arabidopsis* Genome Initiative.

CO 2. Understand the term genomics and also to differentiate between functional and structural genomics with suitable examples.

CO 3. Describe the role of Sequence Tagged Sites (STSs) in human genomics.

CO 4. Understand the concept of proteomics, structural organisation of proteins and protein structure and function relationship.

CO 5. Learn about the basic concepts of Operating Systems, programming language (C+,C++), algorithm and flow-chart.

CO 6. Understand batch online and real-time data processing in industries and bioreactors.

CO 7. Learn about internet applications and the concept of data mining.

CO 8. Explain the role of computer science in bioinformatics.

CO 9. Classify the different types of biological database with examples

CO 10. State the importance of using a database.

CO 11. Explain the different biological data formats that can be used to store data in the biological database.

CO 12. Describe the different types of BLAST programs and its applications.

CO 13. Learn the application of bioinformatics in various fields and at different cellular levels

CO 14. Explain the role of genomics, transcriptomics and proteomics in bioinformatics.

Course: Paper VIII P – Laboratory

The students will learn how to:

CO 1. Retrieve a nucleotide sequence and a protein sequence from NCBI

CO 2. Retrieve a research article from NCBI PubMed

CO 3. Perform NCBI BLAST to search for similar sequences based on homology.

CO 4. Retrieve a nucleotide sequence from DDBJ and EMBL.

CO 5. Retrieve a protein sequence from Swissprot/Uniprot

CO 6. Retrieve a biological pathway from KEGG

CO 7. Visit to educational institute/biotech firms and submit the report

B. Sc. BIOCHEMISTRY

DEPARTMENT OF BIOCHEMISTRY

COURSE OUTCOMES (COs)

SEMESTER I

Course: Paper I T – Biomolecules and Biophysical Techniques (Theory)

After successful completion of the course, students will be able to:

CO 1. Describe molecular structure, the hydrogen bonds involved and physical properties of water.

CO 2. Understand pH, pK and buffers in laboratory and biological system.

CO 3. Identify and understand the properties, structure and classification of monosaccharides (glucose & fructose), disaccharides (sucrose, maltose and lactose) and polysaccharides (dextrins, starch, glycogen and cellulose).

CO 4. Understand mechanism of stereochemistry of sugars: chiral carbon, epimers, anomers, mutarotation, chair and boat forms, glycosides, glycopyranoseandfructopyranose.

CO 5. Describe alpha amino acids: structure and properties of amino acids; proteins: primary structure (structure of peptide bond-restricted rotation, cis/trans); secondary structure (α, β and super secondary structures); tertiary structure - protein folding; and quaternary structure of proteins.

CO 6. Explain the importance of fatty acids its nomenclature and chemical properties

CO 7. Classify lipids and understand the general structure and function of the major lipid subclasses like acylglycerols, phosphoglycerides, sphingolipids, waxes and terpenes, steroids and prostaglandins.

CO 8. Describe nucleotides chemistry and properties. Explain Nucleic acids: DNA and RNA forms and functions.

CO 9. Describe the principles and applications of centrifugation, chromatography (gel, ion exchange and affinity), electrophoresis (PAGE & SDS-PAGE), UV/visible spectrophotometry, X-ray crystallography, spectroflourimetry, microscopy (light & electron) and NMR.

CO 10. Explain isotopes, radioactive decay, α, β and γ radiation.

CO 11. Describe the methods for detection of radioactivity (scintillation counting, labeling, quenching and autoradiography).

Course: Paper I P – Biochemistry Practical – I

The students will learn how to:

CO 1. Prepare buffer solution using Henderson-Hasselbalch equation and describe the verification of Beer-Lambert's Law.

CO 2. Estimate protein by Lowry's method and Bradford's method.

CO 3. Estimate DNA using diphenylamine.

CO 4. Estimate RNA using orcinol.

SEMESTER II

Course: Paper II T – Thermodynamics, Membrane Biophysics and Biostatistics (Theory)

After successful completion of the course, students will be able to:

CO 1. Describe thermodynamics, membrane biophysics, law of thermodynamics and its application to biological systems, first law of thermodynamics, heat of formation and heat of reaction, second law of thermodynamics, molecular basis of entropy, Helmholtz and Gibbs free energy.

CO 2. Analyse the types of cells, electrodes, oxidation-reduction reaction, standard electrode potential and its determination, measurement of ΔG.

CO 3. Understand electron transfer measures and phosphate group transfer potentials, coupled reactions and simultaneous equilibria.

CO 4. Determine membrane and membrane transport like Fluid Mosaic model, uniport, symport, antiport, active and passive transport.

CO 5. Understand biostatistics, collection of data, primary and secondary data, classification and tabulation of data.

CO 6. Determine measures of central tendency, measures of dispersion, methods of sampling-sampling theory and test of significance (definition of random sampling, simple random sampling, systematic and stratified sampling and confidence level for those sample statistics), correlation coefficient and regression analysis.

CO 7. Describe probability (theorem on total probability of two events, definition of conditional probability with some elementary problems).

CO 8. Understand distribution - definition properties and uses of Bernoulli trials, Binomial, Poisson and Normal distribution.

CO 9. Describe the definition and applications of x2, t, F & Z statistic: definition of confidence level and limits.

CO 10. Estimate amino acids by Ninhydrin method and estimate carbohydrates by Anthrone method.

CO 11. Analyse separation of carbohydrates by paper chromatography, amino acids by paper chromatography and Separation of lipids/pigments using thin layer chromatography (TLC).

Course: Paper II P – Biochemistry Practical – II

The students will learn how to:

CO 1. Estimate amino acids by Ninhydrin method

CO 2. Estimate carbohydrates by Anthrone method.

CO 3. Analyze separation of carbohydrates by paper chromatography

CO 4. Analyze separation of amino acids by paper chromatography

CO 5. Analyze separation of lipids/pigments using thin layer chromatography (TLC).

SEMESTER III

Course: Paper III T – Proteins and Enzymes (Theory)

After successful completion of the course, students will be able to:

CO 1. Describe proteins, protein isolation and purification techniques like salt precipitation, dialysis and chromatography.

CO 2. Analyse criteria for homogeneity and protein sequencing.

CO 3. Describe enzymes, enzyme activity and specific enzyme activity with its classification.

CO 4. Understand enzyme-substrate (ES) complex: concept of substrate binding sites and active sites, significance of activation energy and free energy.

CO 5. Determine the Factors affecting enzyme activity

CO 6. Understand coenzymes (Pyridoxal phosphate, NAD+ & FAD+) and cofactors.

CO 7. Analyse the mechanism of enzyme catalysis (chymotrypsin & lysozyme).

CO 8. Determine the Michaelis-Menten equation: derivation, significance of Vmax, kcat, Km and Lineweaver-Burk Plot.

CO 9. Undestand enzyme inhibition: competitive, non-competitive and uncompetitive.

CO 10. Determine the regulation of enzyme activity, allosteric regulation, covalent modification, zymogenicity and protein turnover.

CO 11. Analyse the separation of proteins by SDS-PAGE, Gel filtration chromatography using protein mixture or dye and assay of urease/amylase activity

CO 12. Determine Km and Vmax of urease/amylase and effect of temperature and substrate concentration on enzyme activity.

Course: Paper III P – Biochemistry Practical – III

The students will learn how to:

CO 1. Analyze the separation of proteins by SDS-PAGE.

CO 2. Perform gel filtration chromatography of protein mixture or dye.

CO 3. Assay urease/amylase activity.

CO 4. Determine Km and Vmax of urease/amylase.

CO 5. Analyze the effect of temperature and substrate concentration on enzyme activity.

SEMESTER IV

Course: Paper IV T – Cell Biology and Physiology (Theory)

After successful completion of the course, students will be able to:

CO 1. Understand cell structure and components like structure of viruses (bacteriophages and TMV).

CO 2. Describe eukaryotic cell structure and sub cellular organelles, differentiate between plants and animal cells in structure and functions.

CO 3. Determine the methods for studying cells and organelles.

CO 4. Understand phase contrast, staining and freeze fracture technique.

CO 5. Analyze sub-cellular fractionation using centrifugation, differential and density gradient centrifugation.

CO 6. Describe cytoskeleton: microtubules and microfilaments; cell motility - ciliary and flagellar movement, bacterial taxis.

CO 7. Understand the concept of cell division (mitosis & meiosis), cell cycle and its regulation.

CO 8. Understand the importance of apoptosis and stem cells.

CO 9. Determine the physiology of homeostasis.

CO 10. Understand the physiology of digestion, absorption and transport of carbohydrates, lipid, proteins and nucleic acids.

CO 11. Understand absorption and transport of minerals (Fe++ and Ca++) and vitamins (C and D).

CO 12. Describe blood cells, importance of hemoglobin, oxygen and carbon dioxide transport; regulation of respiration and blood clotting.

CO 13. Describe formation of urine, regulation of water, electrolyte balance and role of hormones in its maintenance.

CO 14. Analyze action potential, impulse transmission, synaptic transmission, muscle protein, mechanism of muscle contraction (skeletal and smooth) and the biochemistry of vision.

CO 15. Describe and classify hormones.

CO 16. Understand receptors, intracellular cell surface and second messengers.

CO 17. Analyze hormones of the pituitary, thyroid and pancreas.

CO 18. Evaluate the basic mode of steroid and protein/peptide hormone action mechanisms.

CO 19. Identify the RBC and WBC count.

CO 20. Understand mitosis and meiotic cell division.

CO 21. Understand sub-cellular fractionation of organelles.

Course: Paper IV P – Biochemistry Practical – IV

The students will learn how to:

CO 1. Identify RBC and WBC count.

CO 2. Study mitosis and meiotic cell division.

CO 3. Perform sub-cellular fractionation of organelles.

SEMESTER V

Course: Paper V T – Intermediary Metabolism (Theory)

After successful completion of the course, students will be able to:

CO 1. Understand the basic concepts of metabolism.

CO 2. Describe carbohydrate metabolism, importance of glycolysis, Warburg effect and alcoholic fermentations, TCA cycle, regulation of glycolysis of TCA cycle, gluconeogenesis, glycogenesis, glycogenolysis and pentose phosphate pathway.

CO 3. Describe lipid metabolism: hydrolysis of triacylglycerols, transport of fatty acids into mitochondria, β-oxidation of saturated fatty acids, oxidation of unsaturated and odd chain fatty acids, ATP yield from fatty acid oxidation.

CO 4. Describe biosynthesis of saturated fatty acids, unsaturated fatty acids, triglycerides and cholesterol.

CO 5. Analyze the amino acid metabolism, transamination, oxidative deamination and decarboxylation.

CO 6. Explain urea cycle, biosynthesis of amino acids such as glutamine, tryptophan and histidine.

CO 7. Understand degradation of amino acids.

CO 8. Describe nucleotide metabolism: sources of atoms in purine and pyrimidine molecules, biosynthesis, degradation and regulation.

CO 9. Understand importance of bioenergetics: photosynthetic and respiratory electron transfer chain, photophosphorylation, mechanism of ATP production, inhibitors of electron transport chain and uncouplers of oxidative phosphorylation.

CO 10. Determine the isolation of casein from milk, isolation and estimation of starch from potato, isolation and estimation of glycogen from animal tissues and isolation and estimation of photosynthetic pigments.

Course: Paper V P – Biochemistry Practical – V

The students will learn how to:

CO 1. Isolate casein from milk.

CO 2. Isolate and estimate starch from potato.

CO 3. Isolate and estimate glycogen from animal tissues.

CO 4. Isolate and estimate photosynthetic pigments.

SEMESTER V

Course: Paper VI T – Nutritional and Clinical Biochemistry (Theory)

After successful completion of the course, students will be able to:

CO 1. Understand the concepts of nutritional biochemistry

CO 2. Understand dietary habits: nutritive values of carbohydrates, fats, protein, vitamins (A, D, E, K, vit B complex and vit C) and minerals (Ca, Fe and iodine).

CO 3. Describe basal metabolic rate (BMR).

CO 4. Analyse calorimetry: specificdynamic action (SDA) and recommended daily allowance (RDA) of foods; protein-calorie malnutrition (Kwashiokor and Marasmus).

CO 5. Identify overnutrition and obesity.

CO 6. Describe clinical biochemistry: basic concepts and scope in health and diseases.

CO 7. Analyse the collection and preservation of biological fluids [blood, plasma, serum, urine, cerebral spinal fluid (CSF) and amniotic fluid], blood and urine.

CO 8. Understand the normal values of important constituents in blood (Plasma/serum), CSF and urine, clearance test for urea.

CO 9. Explain enzyme pattern in health and diseases such as lipases, amylases, cholinesterases, alakaline and acid phosphatases, SGOT, SGPT, LDH and CPK.

CO 10. Describe isoenzymes and diagnostic tests such as functional tests of liver and kidney.

CO 11. Understand the inborn errors of metabolism such as alkaptonuria, phenylketonuria and albinism.

CO 12. Discuss the metabolic disorders such as Hypo- and Hyper-glycemia, gout and porphyrias.

CO 13. Determine the estimation of blood haemoglobin, serum GOT, serum GPT, blood urea, serum alkaline phosphatase, bilirubin, blood glucose, and creatinine.

Course: Paper VI P – Biochemistry Practical – VI

The students will learn how to:

CO 1. Estimate blood haemoglobin.

CO 2. Estimate serum GOT and serum GPT.

CO 3. Estimate urea in blood.

CO 4. Estimate serum alkaline phosphatase.

CO 5. Estimate bilirubin.

CO 6. Estimate blood glucose.

CO 7. Estimate creatinine.

SEMESTER VI

Course: Paper VII T – Microbiology and Immunology (Theory)

After successful completion of the course, students will be able to:

CO 1: Describe types and characteristics of microorganisms.

CO 2. Understand growth curve and use of selection media in bacterial cultivation.

CO 3. Describe the role of microorganisms in food spoilage and food-borne infections.

CO 4. Understand microbial genetics: transformation, conjugation, transduction and transfection and plasmids.

CO 5. Understand basic concepts in immunology: immunity, innate and adaptive immunity.

CO 6. Describe cells and organs of the immune system.

CO 7. Determine immunoglobulins: structure, functions and classes of antibodies

CO 8. Explain antigens, mechanism of antigen-antibody interactions, immunogens, haptens, adjuvants and haemotopoietic stem cells.

CO 9. Describe clonal selection theory.

CO 10. Discuss the structure and functions of MHC molecules.

CO 11. Understand the genetic basis of antibody diversity, complement fixation, hypersensitivity and allergy.

CO 12. Describe autoimmune diseases, monoclonal antibody and its application in biology and vaccines.

CO 13. Describe the isolation of microbes from water and soil using selective media, bacterial growth kinetics and the effect of antibiotic on bacterial growth.

CO 14. Determine ABO blood groups and Rh factor and antigen-antibody specificity by immunodiffusion (ODD).

Course: Paper VII P – Biochemistry Practical – VII

The students will learn how to:

CO 1. Isolate microbes from water and soil using selective media.

CO 2. Analyze bacterial growth kinetics.

CO 3. Analyze effect of antibiotic on bacterial growth.

CO 4. Determine ABO blood groups and Rh factor.

CO 5. Determine antigen-antibody specificity by immunodiffusion (ODD).

Course: Paper VIII T – Molecular Biology (Theory)

After successful completion of the course, students will be able to:

CO 1. Understand the concept of nucleic acids as genetic material, its experimental evidence like bacterial genetic transformations and Hershey-Chase experiment.

CO 2. Describe the salient features of viral, prokaryotic and eukaryotic genomes; repetitive DNA sequences.

CO 3. Understand basic concepts of DNA replication in prokaryotes (semi-conservative, semi-discontinuous and mechanism), inhibitors of DNA replication and compare with eukaryotic replication.

CO 4. Describe transcription mechanism in prokaryote and inhibitors of transcription.

CO 5. Identify regulatory RNA (miRNA and snRNA), catalytic RNA and salient differences in eukaryotes.

CO 6. Understand the basic features of the genetic code, wobble hypothesis, mechanism of prokaryotic translation, salient differences in eukaryotes and signal sequences.

CO 7. Describe the regulation of gene expression in prokaryotes: lac operon and trp operon.

CO 8. Describe molecular cloning, general approach and application of recombinant DNA technology such as PCR, RT-PCR and qPCR.

CO 9. Understand the basic concepts in bioinformatics: gene and protein databases.

CO 10. Analyse the isolation of DNA from animal/plant systems, agarose gel electrophoresis of DNA, measurement of melting temperature (Tm) of DNA sample and the amplification of DNA using PCR technique.

Course: Paper VIII P – Biochemistry Practical – VIII

The students will learn how to:

CO 1. Isolate DNA from animal/plant systems.

CO 2. Perform agarose gel electrophoresis of DNA.

CO 3. Measure the melting temperature (Tm) of DNA sample.

CO 4. Perform amplification of DNA using PCR technique.

BACHELOR OF SCIENCE IN BOTANY

Programme Specific Outcomes (PSO)

The Programme Specific Outcomes based curriculum in Botany includes

1. Students acquire fundamental knowledge about plants through theory and practicals.
2. Students will understand the nature and basic concepts of all the components of plant science.
3. Students will learn about the plant diversity of the north eastern region in particular and country in general.
4. Students will become aware of bioresources, their sustainable utilization and conservation.
5. Students will get hands on experience with the tools and techniques used in biological sciences such as plant tissue culture, plant breeding and herbarium sheet preparation.

Course outcomes

On completion of Bsc course, students will are expected to get equipped with the following course outcomes

Paper 1 (Algae Bryophytes and Pteridophytes -THEORY)

The student will learn about

1. Classification, structure, pigmentation, food reserve, economic importance and life cycles of algae.
2. Classification, structure, origin and evolution and life cycles of few selected bryophytes.
3. Classification,evolution of vascular system, economic importance and life cycles of few selected pteridophytes.

Paper 1 (Algae Bryophytes and Pteridophytes-PRACTICALS)

The student will learn about

Students will be able to dissect the vegetative and reproductive parts of the prescribed specimens along with drawings, description and identification up to genus level.

Paper 2 (Gymnosperms, Paleobotany, Morphology and Anatomy-THEORY)

The student will learn about

1. Classification, structure, evolution, economic importance and life cycles of selected gymnosperms.
2. Geological time scale, general account of fossil gymnosperms and their formation with special reference of dominant Jurassic flora.
3. Basic concepts in floral morphology, bracts, inflorescence and leaf with a knowledge of evolution trends of stamens and carpels.
4. Basic concepts of vascular elements, organization of apical meristem, stomata types. Normal and anomalous secondary growth of selected genera.

Paper 2 (Gymnosperms, Paleobotany, Morphology and Anatomy-PRACTICALS)

The student will learn about

1. Students will learn double staining techniques to study anomalous secondary growth.
2. Students will learn dissection, drawing, description and identification of prescribed gymnosperms and their reproductive structure.
3. Study of permanent fossil slides.

Paper 3 (Angiosperm taxonomy, Economic botany, Ethnobotany and Phytogeography THEORY)

The student will learn about

1. The students are made acquainted with different systems of classification of angiosperms with emphasis on natural (Bentham and Hooker) and phylogenetic (Hutchinson) classification and the Principles governing Botanical Nomenclature with special reference to Rules of Priority and Type methods.
2. Diagnostic characters of few selected dicot and monocot families of North east India along with their economic importance.
3. Study of economically and ethnobotanical important plants and plant products.
4. Phytogeography with emphasis on floristic region and plant distribution in India, and centre of orgin of cultivated plants.

Paper 3 (Angiosperm taxonomy, Economic botany, Ethnobotany and Phytogeography - PRACTICALS)

The student will learn about

1. Skills in floral dissection, display, drawings and description in technical language and method of identification up to genera through proper keys.

2. Exposure to field study organized through field trips, method of collection of plant specimens and preparation of herbarium sheets which are to be submitted for examination.

3. Chemical methods of qualitative detection of starch, protein, fats and cellulose.

Paper 4 (Microbiology, Mycology and Plant Pathology THEORY)

The student will learn about

1. About basics of some special groups of microorganisms, ultrastructural details of bacteria and their reproduction.
2. Classification and characters and structures of viruses and their life cycle patterns.
3. Microbes – their growth, nutrition, role in decomposition of organic matter and food spoilage; antibiotics
4. Classification, structure, life cycles and economic importance of fungi in general with emphasis on some prescribed genera in particular.
5. Basic concept of growth forms, structure and economic importance of lichens.
6. Plant diseases and their classification, transmission and dissemination in general with reference to symptoms, disease cycles, control measures of some prescribed diseases in particular;

Paper 4 (Microbiology, Mycology and Plant Pathology PRACTICALS)

The student will learn about

1. Dissection, drawing and description and identification up to genera of prescribed fungal and pathological specimens.
2. Calibration of microscope and gram staining of bacteria.

Paper 5 (Plant physiology and Biochemistry THEORY)

The student will learn about

1. The importance of water potential. Mineral nutrition - properties and deficiency symptoms and Translocation of minerals.

2. Detail mechanism of photosynthesis, respiration, photorespiration and biological nitrogen fixation; photoperiodism and vernalization; role of some plant growth regulators in plants as well as dormancy of seeds and process of senescence in plants.
3. The molecular structure, functions, properties and classification of carbohydrates, Amino Acids and Proteins.
4. The fundamental concepts of thermodynamics with special emphasis to living systems.
5. The classification, structure, mechanism of action and kinetics of enzymes and catalysis including a basic understanding on the roles of vitamins in this context.

Paper 5 (Plant physiology and Biochemistry PRACTICALS)

The student will learn about

Basic experimental tools and techniques in plant physiology and biochemistry to study transpiration rates, water potential, photosynthesis, quantitative estimation, chromatography and enzyme kinetics.

Paper 6 (Ecology and Conservation Biology THEORY)

The student will learn about

1. The ecological hierarchy which forms the platform of interaction between different ecological factors with living organism leading to manifestation of ecological adaptations in plants to overcome the environmental stress for optimum survival.
2. Population attributes and co-relation resulting in positive and negative interactions that determine their extent of growth analysed through survivorship and growth curves.
3. Qualitative parameters of community structure which leads to community development through different stages of succession with typical case studies on hydrosere and xerosrer.
4. Ecosystem – structure (biotic and abiotic components) and function (energy flow, ecological pyramids, primary productivity, food chain and food web); biogeochemical cycles (Water, Carbon and Phosphorus).
5. Environmental pollution (air, water and soil) with emphasis on Global environmental problems; biodiversity and conservation.

Paper 6 (Ecology and Conservation Biology PRACTICALS)

The student will learn about

1. The spatial and temporal variations in climatic factors and detailed analysis of soil – soil pH, soil moisture content and soil organic matter of samples collected from different sites.
2. The quantitative attributes of community by determining requisite size and number of quadrats which are used as sampling units.
3. Sectioning of plant materials to study the different adaptive features in plants.

Paper 7: (Genetic, Plant Breeding and Molecular Biology THEORY)

The student will learn about

1. The process and significance of Meiosis and Mitosis, Structure of chromosomes and their role in inheritance, Mendel's laws of inheritance, gene interaction, Linkage, crossing over and concepts of alleles and multiple alleles.
2. Extra nuclear inheritance with examples.
3. Sex chromosomes and mechanism of sex determination; chromosomal aberrations in plants.
4. The application of different techniques of crop improvement through breeding programmes like domestication, pure line selection, mass selection and hybridization and the role of gene mutation in crop improvement, the knowledge which they may carry in future to researches related to food grain production in the country.
5. The molecules of life namely DNA, RNA and Proteins including their molecular structure, synthesis and role in life specifically with reference to prokaryotic systems.
6. Modes of genetic information transfer in bacteria including conjugation, transformation and transduction.
7. Operons, their structure, types and mode of function.

Paper 7: (Genetic, Plant Breeding and Molecular Biology - PRACTICALS)

The student will learn about

Basic experimental tools and techniques in genetics, plant breeding and molecular biology to study mitosis, meiosis, polyteny, mendelian ratios, quantitative estimation of DNA, RNA and protein and hybridization of self pollinated plants.

Paper 7: (Plant reproductive biology and plant biotechnology THEORY)

The student will learn about

1. Detail process involving microsporogenesis, microgametogenesis, megasporogensis and megagametogenesis; pollen distribution in time and space; pollen pistil interaction leading to fertilization and endosperm formation.
2. Concept of Totipotency and cellular differentiation. Methods, Tools and techniques of Micropropagation. Production of haploid plants. Cryopreservation, vitrification and artificial seeds.
3. Concepts, applications, tools and techniques and notable achievements within the field of genetic engineering.
4. Basic concept of the rapidly growing field of bioinformatics.

Paper 7: (Plant reproductive biology and plant biotechnology PRACTICALS)

The student will learn about

Basic experimental tools and techniques in plant reproductive biology and plant biotechnology to study pollen morphology, endosperm, embryo and tissue culture.

BSc IN CHEMISTRY

PSO 1:

Understands the basic concept of organic, inorganic and physical chemistry and be acquainted with the diversified branches of chemistry like analytical, environmental, polymer, biochemistry, medicinal, nano-chemistry etc.

PSO 2:

Ability to interrelate and interact chemistry to the other subjects like mathematics, physics, biological science etc.

PSO 3:

Have a broad foundation in chemistry concerning scientific reasoning and problem solving with a molecular perspective.

PSO 4:

Develops skills of conducting qualitative and quantitative analysis of chemicals through the use of standard laboratory instruments or modern equipment to carry out experiments in laboratories as well as in industries.

PSO 5:

Be aware of the principles and guidelines of green chemistry to perform experiments without disturbing the equilibrium of nature.

Course 1: Inorganic Chemistry:

CO1.1 - Describe about the quantum mechanical concept of structure of atoms, different nuclear reactions and radioactivity and also describe about the periodic properties of different elements.

CO1.2 - Gives the students idea about chemical bonding in different Inorganic molecules.

CO1.3 - Describes about the principles of qualitative and quantitative analysis and hence this course gives the students idea about analysis of a sample and estimation of its quantity.

CO1.4 - Describes about the different concepts of acids and bases, helps the students to identify oxidising agents and reducing agents in a reaction.

CO1.5 - Explains the concept of metallurgy and describes about the different industrial applications of chemistry.

CO1.6 - Classify the elements as s-block, p-block, d-block and f-block depending upon their electronic configuration and it gives the students detailed knowledge about periodic properties of different elements. it also describes about the preparation and uses of some important compounds.

CO1.7 - Describes about coordination compounds: their geometry, magnetic properties and reactivity. It also give a detailed knowledge about Crystal field theory of bonding in coordination compounds.

CO1.8 - Describes about organometallics, different inorganic polymers, interhalogens, polyhalides and pseudohalides and this course gives the students knowledge about their synthesis, properties, bonding, structure and applications.

CO1.9 - Describes about earth's atmosphere, waste water treatment, solid waste and radioactive waste disposal.

CO1.10 - Gives the students idea about molecular symmetry and knowledge about data analysis.

CO1.11 - Describes about the effect of metal ions in living systems and also gives the students knowledge about different drugs.

CO1.12 - Describes about applications of UV-Visible and IR spectroscopy for Inorganic and Coordination compounds.

CO1.13 - gives a general introduction to nanomaterials: their types, synthesis and important applications.

Course 2: Organic Chemistry:

CO2.1 - Describes about the structure, bonding and properties of different organic compounds.

CO2.2 - Gives a general idea about stereochemistry of organic molecules.

CO2.3 - Describes about aliphatic and aromatic hydrocarbons and it gives the students detailed knowledge about their nomenclature, bonding and different chemical reactions involved.

CO2.4 - classify the different types of reactions involving organic molecules

CO2.5 - Gives a detailed knowledge to the students about alcohols, phenols, aldehydes and ketones: their nomenclature, methods of preparation, physical properties and chemical reactions involved.

CO2.6 - Gives a detailed knowledge to the students about carboxylic acids and their derivatives, organometallic compounds and active methylene compounds: their nomenclature, methods of preparation, physical properties and chemical reactions involved.

CO2.7 - Gives a detailed knowledge to the students about nitro compounds, amines and diazo compounds: their nomenclature, methods of preparation, physical properties and chemical reactions involved.

CO2.8 - Gives a detailed knowledge to the students about Carbohydrates, amino acids, urea and Drugs.: their classification, synthesis, properties and chemical reactions involved.

CO2.9 - gives the quantitative ideas about synthesis, properties and uses of heterocyclic compounds, fats, oils, soaps and detergents and it gives a detailed knowledge about dyes.

CO2.10 - Gives a detailed knowledge about organic acids and bases and about polynuclear aromatic hydrocarbons.

CO2.11 - Gives a general introduction about dienes and organic polymers

CO2.12 - Gives a detailed introduction to organic synthesis, rearrangement reactions and interconversions.

CO2.13. - gives the students the principles of green chemistry and few methods of using green chemistry in chemical transformation.

CO2.14 - Gives a detailed introduction to natural products, peptides, proteins, vitamins, enzymes and nucleic acids.

CO2.15 - Gives a detailed introduction to organic photochemistry and the applications of spectroscopy for structural analysis.

Course 3: Physical Chemistry:

CO3.1 - Gives detailed introduction about the behaviour, properties and applications involving Gaseous state,liquid state and solid state.

CO3.2 - Gives a detailed idea about the principles and applications of thermodynamics and thermochemistry.

CO3.3 - Gives a detailed idea about the principles and applications of chemical kinetics

CO3.4 - Gives a detailed idea about the principles and applications of electrochemistry

CO3.5 - Gives a detailed knowledge to the students about solutions and colloids.

CO3.6 - Gives a detailed knowledge to the students about principles and applications surface chemistry.

CO3.7 - Gives a detailed knowledge to the students about principles and applications of chemical equilibrium, ionic equilibrium and phase equilibria.

CO3.8 - Gives a detailed knowledge to the students about the properties and importance of macromolecules.

CO3.9 - Gives a detailed idea about the principles and applications of spectroscopy

Programme Specific Outcomes (PSOs) and Course Outcomes (COs) for Bachelor of Commerce offered by St. Anthony's College, Shillong

PROGRAMME SPECIFIC OUTCOMES

The Department of Commerce, St. Anthony's College, Shillong offers the three year undergraduate Honours course in Commerce. The Department has a defined set of Programme Specific Outcomes (PSOs) which guides the teaching learning and evaluation process in the Department. On completion of this course the student should attain the following attributes.

PSO-1: The students can get the knowledge, skills and attitudes during the end of the B.Com degree course.

PSO-2: By goodness of the preparation they can turn into a Manager, Accountant, Management Accountant, Cost Accountant, Bank Manager, Auditor, Company Secretary, Teacher, Professor, Stock Agents, Government employment and so on.

PSO-3: Students will prove themselves in different examinations like CA, CMA, CS, MPSC and UPSC.

PSO-4: Students will acquire the knowledge and skill in different areas of communication, decision making, innovations and problem solving in day to day business activities.

PSO-5: Students will gain thorough systematic and subject skills within various disciples of accounting and finance, auditing and taxation, banking and insurance, management and marketing, information technology in business, mathematical knowledge as well.

PSO-6: Students can also get the practical skills to work as accountant, audit assistant, tax consultant, marketing analyst, banker, insurance advisor and so on.

PSO-7: Students will be able to do their higher education and do research in the field of commerce and management.

PSO-8: Students will understand marketing practices in service sector, ethical issues and good governance practices.

PSO-9: Students will enhance the computer literacy and its applicability in business through latest version on tally and e-commerce principles.

PSO-10: Students are able to play the roles of businessmen, entrepreneur and consultant which will help learners to possess knowledge and other soft skills, and to react aptly when confronted with critical decision making.

COURSE OUTCOMES (COs)

The Department follows the syllabus and curriculum structure as mandated by the affiliating University. During the three years of the B.Com (Honours) programme, spread over 6 semesters, 27 commerce papers with optional are taught. The Semester wise distribution of the Papers and their Course Outcomes are listed below.

SEMESTER-I	
Name of the Paper	**COURSE OUTCOMES (COs)**
BC-101: Business Environment	On completion of this course, the students will be able to: **CO-1:** Know the overview of business environment and its impact on businesses. **CO-2:** Understand the objective of five year plans for improving the economic situation in India. **CO-3:** Know the detailed outlook of the growth of industries in India including the Government's role in improving the condition of industries. **CO-4:** Develop ideas about the trade relationship between India and other countries, foreign collaboration and investment.

	CO-5: Learnt the overview of international business environment and the benefits of world trade, the influence of international economies in India.
BC-102: Principles & Practice of Management	On completion of this course, the students will be able to: **CO-1:** Understand the primary functions of management and roles of managers. **CO-2:** Learnt the major contributors to the fields of management. **CO-3:** Understand how managers align the planning process with the company's Mission, Vision and Values. **CO-4:** Understand the components and considerations of strategic management. **CO-5:** Learnt the process and techniques of individual and group decision making.
BC-103: Financial Accounting.	On completion of this course, the students will be able to: **CO-1:** Learnt and apply the principles and concepts of accounting in the preparation and presentation of financial statements of Sole Trading business. **CO-2:** Know the accounting for Not for profit organisation. **CO-3:** Learnt and prepared the accounts of Joint Ventures and Reconstitution of Partnership Firm. **CO-4:** Understand the concept and methods of Dissolution of Partnership Firm and sale of Firm. **CO-5:** Enrich the accounting knowledge with the accounting for special transactions with reference to Branch Accounting, Consignment Accounting and Accounting for Hire Purchase and Installment.
SEMESTER-II	
Name of the Paper	**COURSE OUTCOMES (COs)**
BC-201: Business Economics	On completion of this course, the students will be able to: **CO-1:** Analyse the scope and methods of business economics. **CO-2:** Apply concept and tools of demand analysis. **CO-3:** Enumerate concepts in the theory of production **CO-4:** Understand the concept and tools of cost functions in decision making. **CO-5:** Evaluate market structure and apply pricing methods and approaches.
BC-202: Fundamental Mathematics	On completion of this course, the students will be able to: **CO-1:** Learnt to find the determinant of matrix, inverse of matrix, solve a system of linear equations and apply matrix theory to simple business and economic problems. **CO-2:** Gain knowledge of fundamental concepts of functional relationship and various types of functions and their graphs. **CO-3:** Learnt the concepts of real numbers, concept of limit and continuity of function, concept of differentiation and its rules. **CO-4:** Learnt to apply the concept of differentiation to problems of elasticity of demand and supply, concept of maxima and minima of functions relating to cost and revenues. **CO-5:** Calculate different types of rates of interest and their interrelationship, annuity and its different types, methods of calculation of depreciation on fixed assets and valuation of loans, shares and debentures.
BC-203 : Information Technology in Business	On completion of this course, the students will be able to: **CO-1:** Understand data, information, information system and information technology. **CO-2:** Learnt the types of operation systems, concept of database management system and network topology. **CO-3:** Learnt to use formula in an electronic spreadsheet.

	CO-4: Understand the internet protocols. **CO-5:** Understand the business models, advertising and payment systems used in e-commerce.
BC-204: Indian Financial System	On completion of this course, the students will be able to: **CO-1:** Develop ideas of the structure of the India Financial System, and a purview of its constituents and its functioning. **CO-2:** Understand the conditions of the Indian money market and its impact on the economy. **CO-3:** Understand the conditions of the Indian capital market and its impact on the economy. **CO-4:** Identify the different categorisation of financial institutions in the Indian Financial System, and their respective functions and roles. **CO-5:** Identify the apex institutions that regulate the varied financial institutions in India.
SEMESTER-III	
Name of the Paper	**COURSE OUTCOMES (COs)**
BC-301: Business Statistics	On completion of this course, the students will be able to: **CO-1:** Learnt the key terminology in business statistics and understanding Data, Tabulation and Presentation, tools and techniques used in business statistical analysis. **CO-2:** Calculate measures of central tendency and their variation, Dispersion and their measures; Skewness , Moments, Kurtosis and their measures. **CO-3:** Understand and solve problems in Correlation and Regression, Index Number - its meaning, types, uses and methods of constructing indices. **CO-4:** Learnt Permutations and Combinations; Theory of Probability and its applications; Sampling Theory and its techniques. **CO-5:** Learnt business forecasting methods using Time series analysis, Interpolation and Extrapolation methods.
BC-302: Business Laws	On completion of this course, the students will be able to: **CO-1:** Know the relevance of business law to individuals and businesses and the role of law in an economic, political and social context. **CO-2:** Identify the fundamental legal principles behind contractual agreements. **CO-3:** Learnt how businesses can be held liable in tort for the actions of their employees. **CO-4:** Understand the legal and fiscal structure of different forms of business organizations and ability to know the details of Negotiable Instruments. **CO-5:** Know the laws related to Company Act and Consumer Protection Act.
(Optional Honors-Group -A) **BC-303:** Corporate Accounting	On completion of this course, the students will be able to: **CO-1:** Understand the concepts and solve the problems in shares and debentures. **CO-2:** Learnt to prepare the Financial Statement of a company as per the Act. **CO-3:** Learnt the concepts and methods of Financial Statement Analysis. **CO-4:** Understand the procedures of Amalgamation, Absorption and Reconstruction of a company. **CO-5:** Know the concepts and methods of valuation of Goodwill and Shares, and prepare a Consolidated Financial Statements.
(Optional Honors-Group-B and D) **BC-304:** Marketing	On completion of this course, the students will be able to: **CO-1:** Acquaint the fundamental concepts and principles of marketing management. **CO-2:** Familiarized the concept of markets and products strategies. **CO-3:** Familiarized the concept of pricing and promotion strategies. **CO-4:** Familiarized the concept of distribution and retailing strategies.

Management	**CO-5:** Exposed the contemporary issues in marketing.
(Optional Honors-Group-C) **BC-305:** Fundamentals of Banking	On completion of this course, the students will be able to: **CO-1:** Gained a basic understanding about the Indian banking industry **CO-2:** Acquired knowledge about the important banking theories and the relationship between banker and customer. **CO-3:** Learnt about the laws and procedures governing banking instruments and the rights and duties of banker. **CO-4:** Gained knowledge about the reforms introduced in the banking sector and the recent developments in banking industry. **CO-5:** Learnt about the importance of regulations in the banking industry.
SEMESTER-IV	
Name of the Paper	**COURSE OUTCOMES (COs)**
BC-402: Financial Management	On completion of this course, the students will be able to: **CO-1:** Learnt the meaning, scope and functional areas. The basic idea is offered on Time Value of Money, Investment, Finance and Dividend etc. **CO-2:** Understand the process and various vital methods viz., Payback period, ARR, NPV, IRR and PI along with comparisons. **CO-3:** Learnt the computational techniques of Equity & Preference Shares, Debt and retained earnings etc. In addition, theories of capital structure and factors affecting capital structure are covered. **CO-4:** Evaluates the factors, forms and models of Dividend Decisions limiting its Models to Walter, Gordon and MM Hypotheses. **CO-5:** Wraps the Concept and Cycle of Working Capital along with its determining factors. It covers managing working capital, Management of Accounts Receivables and Management of Inventory.
(Optional Honors-Group -A) **BC-403:** Auditing	On completion of this course, the students will be able to: **CO-1:** Learnt the concepts and types of Audit and Audit process. **CO-2:** Understand the various audit procedure taken place during the course of audit. **CO-3:** Know the audit of Limited Companies and Specialised Institutions. **CO-4:** Know the process of setting standards on Auditing (SA) in India and the application of SA-200,220,230,240,250 and 260 in the process of audit. **CO-5:** Expose to audit of Entities and Contemporary issues in auditing.
(Optional Honors-Group-B) **BC-404 :** Human Resource Management	On completion of this course, the students will be able to: **CO-1:** Understand the basic concepts, functions and processes of human resource management. **CO-2:** Learnt the role, functions and functioning of human resource department of the organizations. **CO-3:** Design and formulate various HRM processes such as Recruitment, Selection, Training, Development, Performance appraisals and Reward Systems, Compensation Plans and Ethical Behaviour. **CO-4:** Develop ways in which human resources management might diagnose a business strategy and then facilitate the internal change necessary to accomplish the strategy **CO-5:** Evaluate the developing role of human resources in the global arena.
(Optional Honors-Group-C) **BC-405 :**	On completion of this course, the students will be able to: **CO-1:** Acquired a general basic knowledge about the insurance business in general. **CO-2:** Learnt about the essentials of the contract of insurance and the important insurance theories.

Fundamentals of Insurance	**CO-3:** Gained an understanding about the importance of insurance agency and surveyor ship. **CO-4:** Learnt about the features of different types of insurance policies. **CO-5:** Acquired knowledge about the salient features of insurance legislation in India.
(Optional Honors-Group-D) **BC-406 :** Sales & Advertisement Management	On completion of this course, the students will be able to: **CO-1:** Acquaint the fundamental concepts, theories and practices of Sales management. **CO-2:** Awareness on the concept of administration part of selling concept. **CO-3:** Acquaint the fundamental concepts, theories and practices of Advertising management. **CO-4:** Familiarising the concepts of budgeting and scheduling, media strategy, media vehicle, branding and research. **CO-5:** Understanding the effectiveness and contemporary trends in advertising such as media planning and selection, media mix, digital communication and interactive communication tools.
SEMESTER-V	
Name of the Paper	**COURSE OUTCOMES (COs)**
BC-502 : Cost Accounting	On completion of this course, the students will be able to: **CO-1:** Understand the basic concepts of Cost Accounting and its differences with other branches of accounting and how to maintain accounting for materials. **CO-2:** Learnt how to record the time spent by all workers on each activity on a separate job and then applies the appropriate hourly rate. **CO-3:** Learnt how to record, ascertain and presentation of costs data properly so that the management can take actions for cost control and cost reduction. **CO-4:** Learnt the planning of future operations in such a way as to either maximize profits or maintain specified levels of profits at different levels of production and sales. **CO-5:** Learnt how to compare actual performance with the budgeted and take appropriate measures and also to control costs mainly by setting standards for each type of cost incurred. It also helps in analyzing variances and hence judging the effectiveness of managers in controlling the costs for which they are held responsible.
(Optional Honors-Group -A) **BC-503:** Financial Services	On completion of this course, the students will be able to: **CO-1:** Learnt and acquired the skills necessary to participate in managing financial services. **CO-2:** Demonstrate broad and coherent knowledge of the theoretical and professional disciplines of banking, finance, investment analysis, portfolio management, law and the Financial Services Industry. **CO-3:** Know the capacity to integrate technical and conceptual knowledge, and interpersonal skills to work effectively within the Financial Services Industry. **CO-4:** Acquainted with the general terminology of the stock market. **CO-5:** Communicate and explain specialised technical advice, knowledge and ideas, to professionals and non-experts involved with the Financial Services Industry.

(Optional Honors-Group-B) **BC-504 :** Service Management	On completion of this course, the students will be able to: **CO-1:** Create a service culture - learn how to motivate employees to take a customer centric viewpoint and approach to day-to-day decision making and behaviours. **CO-2:** Measure and manage service quality, customer satisfaction, loyalty and value perceptions. **CO-3:** Make a Blueprint a service process for enhanced customer experience. **CO-4:** Analyze the role of employees, customers and technology in service delivery. **CO-5:** Design a servicescape for desired effects on customer and employee behaviour and recover effectively from a service failure.
(Optional Honors-Group-C) **BC-505 :** Bank Management	On completion of this course, the students will be able to: **CO-1:** Acquired knowledge about the Indian banking system and importance of corporate governance in banks. **CO-2:** Learnt about the different functional areas in bank management. **CO-3:** Acquired knowledge about the importance of fund mobilization and deposit mobilization in banks. **CO-4:** Gained an understanding about the importance of fund deployment in banks and management of non-performing assets in banks. **CO-5:** Gained an in depth understanding about the risk management and learnt to apply the simple measurement techniques.
(Optional Honors-Group-D) **BC-506 :** Rural & Agricultural Marketing	On completion of this course, the students will be able to: **CO-1:** Acquaint the fundamental concepts and principles of agricultural and rural marketing, reforms, research and institutional credit. **CO-2:** Create awareness on the importance & role of regulated markets, legislation of agricultural marketing such as APMC act, direct purchasing centers, promotion of PPPs. **CO-3:** Familiarizing the concept of co-operative societies &competitive agricultural marketing. **CO-4:** Acquaint the role and importance of storage, warehousing, pricing and distribution. **CO-5:** Exposing the concept of commodity marketing such as dairy , livestock, grain and processed food.
SEMESTER-VI	
Name of the Paper	**COURSE OUTCOMES (COs)**
BC-602 : Entrepreneurship Development	On completion of this course, the students will be able to: **CO-1:** Understand the concept and process of entrepreneurship and entrepreneur. **CO-2:** Learnt about MSME and its components. **CO-3:** Know how to start a Small business. **CO-4:** Know how to prepare a Business Plan for a venture. **CO-5:** Know the various Financial and Non-financial Institutions supporting MSMEs.
(Optional Honors-Group -A) **BC-603:** Direct Tax Laws & Practice	On completion of this course, the students will be able to: **CO-1:** Learnt the basic concepts and definitions of relevant terms of Income tax. A fairly through idea of calculation of tax liability, detail the tax avoidance, evasion, planning, residential status, Incidence and exemptions etc. **CO-2:** Understand the three important Heads i.e., PGBP, Capital Gains and IFOS. **CO-3:** Wraps clubbing provisions, carry forward of losses. The rebates, reliefs, deductions from GTI under Chapter VI for individuals and firms are

	covered. **CO-4:** Calculate of tax for individuals and firms. It includes Tax planning, tax avoidance and evasion. **CO-5:** Learnt the details of Appeals, Returns, penalties, prosecutions and the framework of hierarchical structure of various positions with powers and responsibilities**.**
(Optional Honors-Group-B) **BC-604 :** Small Enterprise Management	On completion of this course, the students will be able to: **CO-1:** Understand the concepts of financial management and the importance of managing finance in small enterprises. **CO-2:** Identify the concepts and significance of human resource in small scale businesses. **CO-3:** Develop an idea about the concepts and technicalities of production as a process in small businesses. **CO-4:** Identify the marketing concepts and strategies relevant to small businesses. **CO-5:** Develop a clear idea and skills in preparation and management of financial statements in small scale businesses.
(Optional Honors-Group-C) **BC-605 :** Insurance Management	On completion of this course, the students will be able to: **CO-1:** Acquired knowledge about the Indian banking system and importance of corporate governance in banks. **CO-2:** Gained an understanding about the principles of actuarial science and the importance of reserve, surplus and distribution. **CO-3:** Learnt about the importance of pricing, underwriting and settlement mechanism in insurance business. **CO-4:** Acquired knowledge about the management of funds in insurance business and the importance of investment in insurance industry. **CO-5:** Gained an understanding about the concepts of risk management relating to risk identification, risk analysis, control and retention.
(Optional Honors-Group-D) **BC-606 :** Services Marketing	On completion of this course, the students will be able to: **CO-1:** Understanding thee service phenomenon and the relevance of services and marketing of the same in the present world. **CO-2:** Develop an idea of an effective delivery system/systems of services and the system(s) application on different channels and platforms to cater to the needs/wants of service customers. **CO-3:** Identify the strategies in managing and marketing the tourism and travel services in a developing economy. **CO-4:** Know a detailed outlook into the marketing of the varied banking and insurance services in India. **CO-5:** Know a detailed study on the concept and marketing strategies of housing financial services and mutual funds in the Indian context.

BA IN ECONOMICS

The PSOs of the Department of Economics which will enable the students to have clear insights of the Programme are as follows:

- Understand the fundamentals of Micro and Macro Economics at the elementary level.
- Understand the basic concepts of development economics and the issues pertaining to environmental economics.
- Knowledge of the features of the Indian economy including agriculture, industry and various economic reforms in the country.
- Analyse mathematical and statistical tools in various economic principles and relations.
- Familiar with the basic international economic principles, theories and their applications.
- Knowledge of the essential monetary and fiscal policies of the government.

The following are some **methods** adopted by the department to ensure that PSOs and COs are attained:

- Regular interaction and inquiry with students.
- Analysis and reflection with students after each topic to ensure attainment of course outcome.
- Feedback from students is encouraged to ensure positive learning outcomes.
- Departmental review meetings are held regularly to evaluate the learning outcomes.
- Assessment through assignments is also followed to allow the learner to critically asses the theories and topics learnt.
- Exams in the form of class tests are conducted to evaluate the learning pace of each student.
- Self-evaluation of students is encouraged.
- One-on-one mentoring of students is also followed to keep track of a student's progress in the program.
- Open book exams are also held to nurture analytical skills and encourage problem solving.

Paper Number	Name of the Paper	Unit: Name of the Unit	Mechanism of communication	Course Outcome
Paper 1	***Introductory Economic Theory***	I: Consumer Behavior	Lectures, Slides, Notes, Videos	To introduce the basic concepts of micro economic theory.
		II: Production and Cost		To examine the concepts of production functions in the long run and short run and to introduce the concepts of costs and revenue.
		III: Market Structure and Factor Pricing		To examine how price and output is determined in different market conditions. And also to introduce the theories of factors of production.
		IV: National Income		To examine the concepts and measurement of National Income and Green Accounting.
		V: Output and Employment		To understand the classical and neo classical theories of Income and Employment.
Paper II	***Development and Environmental Economics***	I: Concepts and Measurement		To introduce the basics of Development Economics, with discussions on concepts of development, growth, poverty, inequality, and institutions.
		II: Theories of Economic Growth and Development		To use tools of Macroeconomics to understand long run economic phenomena like growth, migration, effort, etc.
		III: International Aspects of Economic Development		To reflect on the role of trade and globalization, on the process of development.
		IV: Environment and Ecology		To understand the economic causes of environmental problems, using theoretical principles and empirical evidence.
		V: Market Failure and Environment		To study the governance of communities and organizations to help answer questions of sustainable growth.
Paper III	***Indian Economy***	I : Features of the Indian Economy		To understand the development paradigm in India post-independence, and to evaluate its

				impact on economic and social indicators.
		II: Agriculture		To examine agriculture specific polices, and their impact in shaping trends in agricultural indicators in India.
		III: Industry		To examine industry specific polices, and their impact in shaping trends in industrial indicators in India.
		IV: Economic Reforms		To understand the role of the economic reforms in shaping and improving economic performance.
		V: Economy of the North-Eastern Region		To review major trends in economic indicators and policy debates in North-Eastern India, in the post-Independence era.
Paper 4	***Mathematics For Economists***	I: Basic Concepts		To introduce the students to the fundamentals of sets, variables, relations and functions, the straight line and its slope.
		II: Matrix and Determinants		To understand the various types, rules and methods of matrices and also their application in economic theories.
		III: Differential Calculus		To expose the students to the concept and rules of differentiation including partial and total differentiation.
		IV: Optimization using Differential Calculus		To introduce the students to the application of differentiation in Economics through optimization problems using the concepts of costs and revenue.
		V:Integration		To study the concepts of Integration, Producer's and Consumer's Surplus.
Paper 5	***Advanced Economic Theory***	I: Consumer Theory		To have an in depth understanding of consumer behavior and ordinal utility.
		II: Theory of Production		To ensure a detailed understanding of production functions by introducing Cobb Doughlas and

				Constant Elasticity of Substitution Production function,
		III: Market Structure and Welfare Economics		To study more market structures and also to introduce the concept of welfare economics.
		IV(Money, Banking and Inflation)		To examine the theories of demand and supply of money, functions and working of central and commercial banks and to discuss the concept of Inflation.
		V:Trade Cycle		To review the theories of trade cycle and to discuss the concepts, components of Balance of Payments.
Paper VI	***International Economics***	I: Introduction, Basic Tools and Trade Theories		To introduce theoretical and empirical concepts in International Trade, with a thorough analytical grasp of trade theory.
		II: Terms of Trade and Gains from Trade		To examine the effects of international trade policies like free trade and protection, on domestic and global welfare.
		III: Tariffs and Quotas		To understand the different tools of international trade policy and their consequences on trade.
		IV: Balance of Payments and Foreign Exchange		To understand a country's Balance of Payments account, and how exchange rate movements between currencies are determined.
		V: International Macro Economic Policies		To introduce the International Monetary System, International Organizations, Regional Trade Blocs, and to reflect on role of the state in the era of globalization.
Paper VII	***Statistics***	I: Central Tendency and Dispersion		To introduce the fundamentals of statistics.
		II: Correlation and Regression		To understand the concepts of correlation and regression and their interpretation in economic analysis.
		III: Time Series		To examine the uses of time series analysis and the various methods in problem solving.

		IV: Index Numbers		To study index numbers and to identify their uses in Economics.
		V: Probability and Sampling		To familiarize the students with the concept and uses of probability and sampling.
Paper VIII	***Public Economics***	I: Introduction to Public Economics		To introduce theoretical and empirical concepts in Public Economics, with a thorough analytical grasp of the implications of government intervention.
		II: Theories of Taxation		To study government taxation using formal analysis, as well as to demonstrate and compare welfare effects of different policy options.
		III: Theories of Public Expenditure		To study government expenditure using formal analysis, and to demonstrate a critical understanding of different theories.
		IV: Fiscal Policy and Fiscal Federalism		To study the efficiency and equity aspects of taxation of the centre and states, and the issues of fiscal federalism and decentralisation in India.
		V: Public Debt and Budget		To introduce the main concepts in public finance, and to understand issues in government expenditure.

BSc IN FISHERY SCIENCE

Programme Specific Outcomes	
PSO 1.	Acquire knowledge on • To identify fishes and understand biology of fishes. • Use of different taxonomical methods in fish identification • To dissect different organs of fishes
PSO 2.	Acquire knowledge on • The different aquatic ecosystems with their physico-chemical and biological characteristics. • The impact of aquatic pollution on the aquatic biota • The type and diversity of plankton
PSO 3.	Acquire knowledge on • The different types of capture fisheries, their importance and scope in fish production. • Fish population dynamics and importance of statistics and their application in fisheries • Estuarine and marine ecosystem along with their fisheries.
PSO 4.	Acquire knowledge on • The concept and prospect of aquaculture and its present status in the south east Asian Countries • Different types of aquaculture practices • Fish farm construction and management
PSO 5.	Acquire knowledge on • Different types of fishing crafts and gears in India • Different types post-harvest technologies used for fish preservation • basic microbiology and fish diseases and its control measures • Fisheries Extension Education and its application in rural areas. • Role of fisheries institutes in India in the development of fisheries sector • Biochemistry, physiology and endocrinology of fish • Applied fish genetics
PSO 6.	Acquire knowledge on • Modern aqua cultural practices • Fish nutrition • Sewage fed fisheries • Culture of air breathing fishes • Brackish water aquaculture and mariculture • Ornamental fishes of India and scope of breeding • Fish reproduction and breeding

	• Developmental biology Induce breeding of carps/air-breathing fishes and hatchery management

Course out comes:

Fish Biology and Taxonomy **CO 1**	Learn the basics on fish and shell fish taxonomy and systematics. Learn the fish morphology and anatomy. Understand classification of fish, prawn and molluscs. Learn fish identification, fish dissection and age determination techniques, Learn the poison gland, electric organ, bioluminescence
Aquatic Ecology **CO 2**	Learn the various aquatic ecosystems *viz*., fresh water, brackish water and marine water ecosystem. Understand the ecological difference of lotic and lentic ecosystems and benthic communities of lotic system. Understand biogeochemical cycles, Physico–Chemical Characteristics of Water and their interrelationship. Learn the ocean currents, wave, tide and its importance on fisheries. Students will learn the trophic dynamics, eutrophication, food chain and biological productivity of aquatic ecosystems. To make them to learn the various types of aquatic pollution and control measures, concepts of bio-monitoring with special reference to aquatic biota. Learn qualitative and quantitative analysis of plankton
Capture Fisheries **CO 3**	Students will learn the types and characteristics of capture fisheries, riverine fisheries of India, important cold water fishes and fisheries and seed resources. To make the students understand the wetland and reservoir fisheries with reference to fish diversity and ecology. Learn the marine and estuarine ecosystem, marine zonation, Economic Exclusive Zones. To make the students understand fish population dynamics, marking and tagging of fishes. Student will able to understand differentiate between the mean, median and mode of the data. Learn the measures of central tendencies, measures of dispersions, correlations and regressions. Students will be able to identify different aquatic ecosystems like wet land, riverine, reservoir ecosystem through exposure visit. To improve the knowledge and technical skills to identification of cultivable fin fish and shell fish.
Aquaculture **CO 4**	To make the students understand history of aquaculture, aquaculture practices classification of aquaculture based on management intensity salinity of water and water temperature. Students learn the different fish culture technologies and its economics namely composite fish culture, integrated fish farming. Design aquaculture ponds and management of water quality to provide best quality environment to fishes.

	Learn control of predatory aquatic insects and aquatic weeds in the aquaculture facilities. Learn estimation of primary productivity and identification of predatory aquatic insects and aquatic macrophytes.
Fish Technology, Pathology and Extension Education **CO 5**	Students will be able to understand the fishing gears and craft used in different parts of India. Students will be able to understand technologies of postharvest technology like icing, drying, smoking, freezing, canning and its role in providing better quality produce to the consumer. Students learn the different fish by-products and value added products. Understand the different types of microbes *viz*, bacteria, virus, fungi, protozoa. Learn the classification of bacteria based on temperature and oxygen requirement. Learn the concept of bacterial growth curve and gram staining technique. Students learn diagnose and manage aquaculture diseases *viz* bacterial, fungal, protozoan, viral, crustacean parasitic diseases, nutritional and environmental diseases. Learn to manage health and prevention issues in aquaculture facilities. Students will be able to understand the concept of extension education, programme planning, communication models, PRA technique and importance leadership development in rural area.
	Students will understand important fisheries institutes of India and role in development of fisheries sector. Learn whole mount preparation of fish parasites, preparation of Histology of fish tissues (liver, intestine and gonads), Preparation of bacterial smears and identification of bacterial strains and Preparation of interview schedule/questionnaires for village survey.
Fish Physiology, Biochemistry and Applied Genetics **CO 6**	Students will acquire the knowledge about the fish physiology and biochemistry and their significance. Learn about the Enzymes, its nature, classification and regulation, Glycolysis, TCA cycle, and lipid metabolism. Students will understand digestion in fish, gas exchange across the gills, effects of various factors in gas exchange and osmoregulation in fresh water, brackish water and marine fishes. Understand the basics of Blood Composition, haemoglobin, circulation of fish and excretion process.

	Learn about structure and function of major endocrine glands in fishes.
	Understand the importance of conservation of fish genetic resources and different methods of conservation.
	Learn in-situ and ex-situ methods *viz*. live gene bank, cryopreservation.
	Understand applied aquaculture genetics and different fish stock improvement techniques i.e. selective breeding, chromosome manipulation, transgenic fish.
	Learn counting of RBC, WBC and preparation of haemin crystals of fish blood.
	Learn analysis and estimation of protein and carbohydrates in fish.
	Learn preparation of fish chromosome slide.
Advanced Aquaculture **CO 7**	Understand the cage and pen culture, Raceways. Trout farming: design and management of a trout farm. Rearing of game and larvicidal fishes.
	To understand the different type feeds and feeding methods in fin fish farming.
	Understand feed preparation
	To understand the common feed ingredients used in aquaculture.
	Acquire knowledge of brood fish and larval nutrition.
	Understand importance of Sewage-fed Fisheries and air breathing culture,
	Learn brackish water and mariculture techniques.
	Learn the identification and classification of indigenous and exotic ornamental fishes and culture techniques.
	Gaining the knowledge and technical skills identification of live feed.
	Learn aquarium setting and maintenance of home aquarium
Fish Breeding and Hatchery Management **CO 8**	Students will be able to understand the types of reproduction, sexual dimorphism, courtship and spawning behaviour. Parental care, migration of fishes.
	Learn the breeding cycles, fecundity and gonado-somatic Index. Maturation of gonads, gametogenesis of fish.
	Understand the Embryonic and larval development fin fish.
	Gain knowledge about natural sources of fish seed, advantages and disadvantages of natural sources.
	Deep understanding of induce breeding of carps and air breathing fish.

Learn selection criteria brood fish and technical skills of hypophysation techniques.

Understand management of brood stock management.

Learn use of hormone of pituitary gland extract/synthetic hormone in inducing carps.

Understand wet and dry bundh methods of carp breeding.

Learn the different types of hatchery used to breed fishes.

Learn designing of eco-hatchery and also operation procedure of eco-hatchery.

Learn the of post larval development of fish from permanent slide.

Learn estimation of physico-chemical parameters of hatchery water.

GEOLOGY DEPARTEMNT

Program Specific Outcomes (PSO)

The Geology Department of St. Anthony's College, affiliated to the North Eastern Hill University (NEHU), offers a three-year Degree course with Geology as an Honours subject only and not as a subsidiary subject. The affiliating university has framed a syllabus with the intention of imparting the basics of the study of earth and laying the foundation on which higher studies can be opted for in the science of Geology. The 3-year course is structured to develop the science of the earth in a gradual and systematic manner and takes into consideration of achieving the following outcomes though an intimate teaching and learning process:

Paper No.	Program Specific Outcomes
GELH 101	Know the different characteristics of the minerals that make up rocks. Learn about earth's external as well as internal earth processes
GELH 102 Prac.	Develop the ability to recognize minerals in hand or microscope scale.
GELH301	Develop the ability to recognize rock structures of the earth's crust and appreciate global earth movements
GELH302 Prac	Learn to read maps and analyze rock structures
GELH 401	Exposure to the description of the rocks of many regions of the country and their fossil content
GELH 402 Prac.	Study rocks of type areas and develop the ability to identify fossils
GELH501	Build up a deeper understanding of rocks and their formation
GELH 502 Prac.	Increase the expertise to identify more rocks under the microscope and hand specimens
GELH 503	Gain knowledge of formation of mineral deposits and their distribution
GELH 504 Prac.	Develop the ability to identify economic minerals
GELH 601	Understand the basics of remote sensing and groundwater hydrology
GELH 602 Prac.	Know how to identify geomorphological and structural features in aerial photographs and estimate groundwater flow

GELH 603	**Understand the application of geology in exploration, drilling, mining and engineering projects and the importance of geology in environmental studies**
GELH 604 Prac.	**Learn to analyze geological data and prepare Field-Reports of the field-trips done through the 6 semesters and face viva-voce**

****

GEOLOGY DEPARTMENT

COURSE OUTCOMES

The 3-year Geology Honours Degree course is split into 6 Semesters of approximately 6 months duration each. There are 8 Theory papers accompanied by 8 Practical papers and 1 paper completely devoted to the Field-Work(s) performed over the 3-year period. In the initial two years, there are 1 Theory paper and 1 Practical paper in each Semester while in the final year there are 2 Theory papers and 2 Practical papers in each Semester, plus 1 Practical paper based on Field-Work.

The Course Outcomes (CO) for each of the Semesters are outlined below:

Semester	Paper No. & Name	Course Outcomes
I	GELH 101 – General Geology and Crystallography & Mineralogy	Learn the varied crystals and minerals that make up the rocks of the earth and understand surficial natural processes as well as getting an overview of global earth processes. On completion of the Semester, a student should: • Have a concept of the origin of the earth • Know the Geological Time Scale • Be familiar with geological processes such as running-water, wind, glaciers and their associated landforms • Basic concept on the transitions of three basic rocks through geological time in a Rock cycle • In-depth understand about earth internal structure and its composition. • Conceptual informations on Plate Tectonics , earthquake and volcanoes. • Become familiar with the common minerals that make up rocks • Have a detailed knowledge of crystals/crystallography • Get acquainted with optical mineralogy • Recognize minerals on the basis of their physical and optical properties

I	**GELH 102 – Crystallography and Mineralogy**	**Study common crystals and minerals in hand specimens and under the microscope and their identification**
II	**GELH 201 - Petrology**	**Study of the Igneous, Sedimentary and Metamorphic rocks that make the earth. On completion, a student should:** • **Understand magma** • **Understand about modes of occurrence of igneous rocks** • **Get the concept of formation of igneous rocks from a magma** • **Get to know the textures and structures of igneous rocks** • **Distinguish the common igneous rocks** • **Understand the processes of formation of sedimentary rocks** • **Distinguish clastic and non-clastic rocks** • **Recognize the common sedimentary rocks** • **Know the concept of metamorphism** • **Know about metamorphic rock fabrics** • **Distinguish and describe the common metamorphic rocks from each other**
II	**GELH 202 - Petrology**	**Recognize and identify different rocks in hand specimen as well as under the microscope**

III	**GELH 301 – Structural Geology and Geotectonics**	**Learn about the rock structures and global tectonics. On completion, a student should:** • **Have an understanding of rock deformation** • **Differentiate primary and secondary structures** • **Know folding** • **Know faults** • **Have a concept of foliation and lineation** • **Understand stress and strain** • **Understand unconformities** • **Have a concept of Continental Drift** • **Develop the concept of Plate Tectonics** • **Appreciate the intricacies of Plate Tectonism with geological time**
III	**GELH 302 – Structural Geology**	**Learn to read topographic maps and geological maps. Understand the concept of map scale. Draw topographic and geological map sections. Learn to use stereonets to analyze structural data**
IV	**GELH 401 – Stratigraphy and Paleontology**	**Learn to appreciate the stratigraphy of different regions of the country. Develop the ability to distinguish the morphological features of fossils and classify them into different groups. At the end of the semester, a student should:** • **Understand the principles of stratigraphy** • **Know the concept of correlation of rocks** • **Understand the methods of description of stratified rocks** • **Be aware of the stratigraphy of different regions of the country from older to younger geological time** • **Know what are fossils and processes of fossilization** • **Know to distinguish the common index fossils on the basis of their morphology** • **Decipher the evolutionary trends of a few selected fossils** • **Know to distinguish the common plant fossils** • **Know about the vertebrate fossils of the country**

IV	**GELH 402 - Stratigraphy and Paleontology**	**Learn the characteristics rocks from different stratigraphic horizons of the country. Develop the ability to meticulously draw and label fossils. Recognize fossils from various stratigraphic ages on the basis of their morphologies**
V	**GELH 501 – Igneous, Sedimentary and Metamorphic Petrology**	**Acquire a deeper understanding of rocks with their genesis and thermo-dynamic significance. Learn to handle more rock types and get a knowledge about some unique rocks and their formation. At the end of the semester, a student should:** • **Have a detailed knowledge of magma – magma generation, origin, types, ascent and diversification** • **Have an introductory knowledge of thermo-dynamics** • **Understand the Phase Rule and crystallization from magmatic melts of a few systems** • **Understand the petrogenesis of some characteristic rocks and rock textures** • **Understand fluid flow and sedimentation** • **Have a concept of provenance of sediments and sedimentary facies** • **Gain the concept of metamorphic changes in rocks** • **Develop the concept of metamorphic facies** • **Understand regional metamorphism of some distinctive rocks** • **Know some characteristic metamorphic rocks**
V	**GELH 502 – Igneous, Sedimentary and Metamorphic Petrology**	**Acquire the capacity to handle more rock types and develop the skill to identify rocks in hand specimen as well as under the microscope**

V	**GELH 503 – Economic Geology**	**Appreciate the economic significance of minerals along with their generation and distribution. After the completion of the semester, a student should:** • **Know what is an ore** • **Have a concept of the varied processes involved in the formation of economic mineral deposits** • **Learn to classify economic mineral deposits** • **Understand the genesis and distribution in India of some useful economic mineral deposits** • **Learn about petroleum – its origin, migration and accumulation and distribution** • **Have an idea of a formation of radioactive mineral deposits as uranium and thorium** • **Know in detail about the formation, qualities, constituents and distribution of coal in India**
V	**GELH 504 - Economic Geology**	**Gain the skills to identify economic minerals on the basis of their physical properties. Also, identify characteristic economic minerals from some distinctive industries**

VI	GELH 601 - Remote Sensing and Hydrology	Builds an appreciation of the significance of geology in the realm of space and groundwater. The paper attempts to introduce students to the applications of geology. At the end of the semester, a student must: • Know the concept of remote sensing • Conceptual knowledge on the process of remote sensing • Have a firm understanding on Sensors and Platforms. • Identify the photoelements of aerial photographs and satellite images • Appreciate 3-D perceptions in remote sensing • Have the knowledge of the applications of remote sensing in geological studies • Develop an elementary knowledge of identifying geological features in aerial photographs • Basic concept on Photogrammetry. • Have a working knowledge of GPS and GIS • Have a concept of the relationship between the hydrologic cycle and groundwater • Know about aquifers and aquifer properties • Have a basic concept of groundwater exploration • Have an elementary idea of where to put up a well • Know of the methods of recharge of groundwater • Identify the sources of groundwater pollution
VI	GELH 602 – Remote Sensing and Hydrology	Develop the ability to identify geological features in aerial photos along with Identification and tracing of lithology and drainage patterns. Learn to estimate groundwater flow and demarcate zones based on water quality/pollution

VI	**GELH 603 – Applied Geology (Exploration, Mining and Engineering Geology)**	**This Paper delves into other applied aspects of geology. It attempts to expose students of the intimacy of geology with exploration, geophysics and geochemistry, mining and engineering. It is basically introductory in nature and at the end of the semester, a student should:** • **Have a concept of geological exploration and the stages involved** • **Have an elementary knowledge about sampling** • **Acquire the concepts of varied types of geophysical surveys** • **Have a concept of geochemical exploration** • **Have an elementary idea of common mining terms** • **Know about some common coal mining methods** • **Appreciate the significance and importance of geological studies in the construction of engineering projects as dams, tunnels and highways** • **Understand mass movement and the causes of landslides and their mitigation**
VI	**GELH 604 – Field-work and Field-report**	**Presentation of the Field-Reports based on the field-trips attended over the three-year course. This part of the syllabus attempts to develop the writing skills necessary for a geological field-report through collection of previous data, noting field observances, analyzing data and preparing a comprehensive explanation of the geology of an area**

****

DEPARTMENT OF MATHEMATICS

Courses Outcomes (CO):

First Semester:
On completion of the first semester course, students will be able to
Algebra I & Calculus-I :

- Prove statements about sets and functions
- Understand Ɛ-δ definition of limits and continuity
- Examine continuity and derivability of a function
- Apply derivative tests in optimisation problems
- Evaluate definite and infinite integrals
- Find inverse of a matrix
- Find solution to a system of linear equations
- Solve first order first degree equations and first order higher degree equations

Second Semester:
Geometry and Vector Calculus:
After completing the second semester course, the students should be able to

- Transform co-ordinate axes
- define conics and obtain standard equations
- to find equation of tangents and normals to the conics
- reduce the general quadratic equations to standard form
- convert cartesian coordinates to polar coordinates, spherical coordinates and cylindrical coordinates
- solve the problems on 3D geometry
- represent vectors analytically and geometrically and compute dot and cross products
- Differentiate vector fields and determine gradient, divergence and curl of vector fields

Third Semester:
Statics and Calculus II:
Upon completion of the course, the students should be able to

- Find resultant of coplanar forces, equilibrium of forces
- Define friction and understand the laws of friction
- Test of convergence and divergence of a given sequence or series
- Understand the concept of asymptotes and obtain their equations
- Expand a function using Taylor's and Maclaurin's series

Fourth Semester:
Algebra II and Dynamics:
On completion of this course, students will be able to

- Get an understanding in basic concepts in group theory
- State and prove Lagrange's theorem and its applications
- Prove De-Moivre's theorem and application to finding solution of equation

- Define projectile, Simple Harmonic Motion and understand direct and oblique impact of elastic spheres
- Find tangential and normal acceleration, radial and transverse acceleration on smooth curves

Fifth Semester:

Elementary Number Theory:

In the sixth semester, students will

- Learn properties of set of integers and study various properties on prime. Learn about congruences and number- theoretic functions.
- Learn to find integer solutions to system of equations

Advanced Calculus I:

- learn Riemann Integral and its properties
- Study different tests for solving improper Integrals of 1^{st} and 2^{nd} kind
- learn Surface Integral and Volume Integral

Differential equations:

- be able to solve linear equations of second order with constant and variable co-efficients
- learn methods to solve linear and non-linear first order PDE

Advanced Dynamics:

- be able to find moments and products of inertia of rigid bodies
- discuss and analyse motion in two dimensions

Sixth Semester:

After completing this course in sixth semester , students will be able to

Advanced Calculus II:

- Basic of metric space, open & closed sets, compactness
- Understand the ideas of continuity and inverse images of open and closed sets
- Prove of various fundamental theorems of Real Analysis.
- Various types of derivatives of function of several variables.

Advanced Algebra:

- Define homomorphisms, kernel of a homomorphism, isomorphism
- Prove Cayley's theorem
- Define rings, zero divisors of a ring, integral domain and prove theorems

Operations Research:

- Learn conversion of real life problems into mathematical problems and calculate optimal solution of models
- predict future movement of a random variable based upon the current circumstances surrounding the variable.
- Obtain optimum strategies for dealing with competitive situation

BA IN MUSIC

The Bachelor's Degree Programme in Music is yet another innovative project of St. Anthony's College. It aims to cultivate and nurture the innate love for music that is woven into the fabric of life and culture of the people of the North Eastern Region of India.

The programme attempts to cover a wide area of music: Indian Classical Music with flavours of both North Indian Hindustani music and South Indian Carnatic music Music of Noth East, giving the students a flavour of music of the North Eastern Region with a special emphasis on the music and musical instruments of the state of Meghalaya Western Music, to familiarize the student with the rich musical traditions of Europe and North America The section on the Music of the North East has also an objective of discovering, documenting and preserving the rich and very often less well known musical traditions of many tribal groups of the North Eastern region of India.

In each of these sections, there are segments having the theory of music, history of music and practicals. One of the highlights of the programme is a section on Computer Technology for music. This section has the objective of introducing the student to the nuances of using computer technology for composing and and sequencing music. This programme will prepare a student for teaching music in schools and give him/her the grounding required to undertake higher studies in music. The programme will refine the musical tastes of the student with a blend of Indian, Western and North Eastern music and equip him/her to take up composition and arrangement of original and creative music.

Course Title	Course Outcomes
First Semester	
Basic Concepts of Indian Classical Music	1. This paper will enable a student to know the rich and diverse traditions of Indian Classical Music, primarily from the conceptual point of view. 2. This section of Indian Classical Music will introduce and familiarizes the students with the great musical traditions of the Indian subcontinent, with special emphasis terms, notations and different modes of singing. 3. Students will be able to know about the life sketch of various musician and musicologist and their contribution to Indian Classical Music. 4. The students will be able to learn about the various Taals and their notation and learn the various Ragas and the notation system used in Indian Classical Music.
Theory of Western Music	1. The student will be able to learn the art of reading and writing music by using staff notation. 2. The student will be introduced to the Philosophy of music and the various aspects of theory of western music. 3. The student will be able to use their theoretical knowledge in conjunction with practical playing of western musical instruments.

Introduction to General Musical Terms	1. Will be able to understand the introduction of the musical syllables used in Khasi Drums as well as the rhythmic pattern of Khasi drums beats. 2. Will have a broader understanding of the festivals of Jaintias which are identified as a course of study in the syllabus. 3. The student will be ale to understand the Garo musical terms which are incorporated in the Garo drum beats. 4. Students will be able to identify the different parts of the membrane, aerophones, chordophones instruments of the Khasis as well as Garos. 5. The students will be able to understand the meaning and depths of the parts of the musical instruments. 6. Through assignment the student will be able to explore the different local musical terms of the different states of North East India. 7. The student will be able to discover the use of musical terms of different tribes of North East India. 8. The student will be able to document the importance of the musical terms used in music and musical instruments of North East India.
Second Semester	
Information Technology	1. Students will be able to learn about Windows, words processing and an introduction to hardware, software and internet. 2. Students will be able to enhance their skills in presentations using powerpoint and learn the different format in word processing.
History of Indian Classical Music-I	1. This paper will enable the student to know about the history of Indian Classical Music. 2. It aims to introduce the student the historical development of Indian Classical Music from the Pre – Vedic times to the present day. 3. The student will also be able to learn about the evolution of Raga and Taal which is one the basic elements of Indian Music. 4. Through this paper a student will know about the comparative study of the Northern and Carnatic Taal system. 5. Learning more about the various Taal notation and singing the Vilambit Khayal apart from the Drut Khayal. 6. The student will understand the difference between the vialmbit and drut Khayal.
Tonic Sol-fa Notation	1. The student will be introduced to the basics of tonic solfa notation. 2. Will be able to notate different tunes. 3. Will be able to identify a note by using the art of listening.
Third Semester	
History of Indian Classical Music-II	1. This paper will help the student in understanding the concept of treatises, Gharanas, 2. A student will also learn about the life sketch of various musicians and their contribution to Indian Music.

	3. Will be able to learn about the importance of aesthetics – rasa in Indian Music. 4. A student will also learn about the notations of taals and raag descriptions.
History of Western Music-I	1. Will be able to understand the origin of music since its inception to the Baroque period. 2. Will be able to identify the musical instruments used in different periods. 3. Will be able to understand the development of music in different eras. 4. Will be able to learn about the life and works of popular composers and their styles. 5. Besides the theoretical portion, the students will be able to render the musical pieces practically of the different composers of different eras.
History of the Music of Meghalaya	1. The students will understand the folk and traditional music and musical instruments of the Khasis as well as their classifications. 2. The students will have a strong understanding of the rhythmic of Khasi drum beats which is a back bone of Khasi music. 3. Will be understand the importance of music in the formation of the Native State. 4. The students will be able to learn and understand the role of the Nokpante which is traditional dormitory of the Garos and how it has a great impact in preserving the culture of the Garos. 5. Not only will the student have a knowledge on the theory of regional music of the state of Meghalaya but will also be equipped with the practical playing of identified musical instruments of the state itself.
Advanced Theory of Western Music	1. The students will have a knowledge of understanding the higher theories associated with Western Music. 2. They will be able to use the expertise in composing, arranging and harmonising.
Sound for Music	1. The students will be introduced to the various techniques of sound management that is required for performing and recording music. 2. Will help the students know about the fundamentals aspects of sound in different media programmes. 3. Students will be able to know with hand on skills in sound production techniques for broadcasting and non - broadcasting application both analog and digital. 4. Students will have a knowledge with production skills employed in TV and Radio journalism. 5. Students will have an understanding of the live sound production during a concert and the function of the PA system.
Fifth Semester	
Computer Application in Music	1. Computer technology for music will covers various aspects of using computers for composing, recording and sequencing music. 2. Students will be introduced to the principles of sound, digitizing audio, and working with MIDI audio, creating music scores

	using score creation software and also to recoding, editing and sequencing both digital audio and MIDI music with software professionally used for that purpose.
Vocal Proficiency in Indian Classical Music	1. This paper which is entirely practical is intended to make the student improve upon the experience gained and make one versatile with vocal rendition of Indian classical music. 2. A student will learn more about the various Ragas and tala notation. 3. The student will also learn the art of singing the Dhrupad gayaki and Tarana style.
History of Western Music-II	1. Will be able to understand the music from the Classical period to early modern period. 2. Will be able to identify the musical instruments used in different periods. 3. Will be able to understand the development of music in different eras. 4. Will be able to learn about the life and works of popular composers and their styles. 5. Besides the theoretical portion, the students will be able to render the musical pieces practically of the different composers of different eras.
Sixth Semester	
Mastering A Western Musical Instrument	1. The students will be able to render the higher levels of musical compositions. 2. Will be able to play the various musical technicalities like scales, arpeggios, etc. 3. The student will be able to improvised based on different beats.
Project Work (Music of Northeast Region)	1. Will have a knowledge about the research methodology required for this research/project. 2. The students will discover the rich musical culture of North East India. 3. The student will be able to explore the importance of music in different festivals and music culture of North East India. 4. Will be able to document the project.

Department of Philosophy

Programme Specific Outcomes (PSO) of Philosophy Honours.

The three year Under Graduate course in Philosophy Honours initiates students to Epistemology and Metaphysics, Logic, Indian Philosophy, History of Modern and Western Philosophy and Ethics, Philosophy of Religion and Existentialism. The course develops interests in learning philosophy with clarity and analysing the philosophical concepts with philosophical reflection and analysis. The course also helps to develop critical thinking. After successfully completing the 3year degree course the following Programme Specific Outcomes outcome are expected of the students:

PSO1: After completion of the three-year honours course in Philosophy students are expected to read the philosophical books written by various philosophers on various philosophical topics to get an overall idea of philosophy and also for widening the philosophical knowledge, to create enthusiasm and interest to do progress in research works and to write small articles on various philosophical topics. To develop the logical thinking capabilities, to inspire other students also to study philosophy.

PSO2: first of all, to developed love for the subject, their power of constructive critical thinking and to provide a reflective, logical and systematic solutions to the problems faced in philosophy, - either metaphysical, empirical social, political and religious.

PSO3: to decide and progress in the philosophical areas which interest them most and to pursue in that area, inquire, understand and to write research articles for the further progress of those areas.

PSO4: to learn and understand the different methods of doing philosophy, understanding their significance and applying them in the relevant areas.

PSO5: At the end of the programme the students are expected to learn the research methodology and to apply them validly while writing research papers. While donning so they are expected to consult both the primary and the secondary sources of books and also to study research articles both contemporary and modern.

PSO6: Recognizing and understanding the different values- personal, social and global, recognizing the value of the total existence and their harmonious relations, building ability to live in harmony in the midst of diversity and its importance

PSO7: Identifying the inherent problems of philosophy and endeavour to reflect logically on them and providing a necessary solution to it.

PSO8: to understand the distinctive features of each philosophical systems either traditional, contemporary or modern and value them.

PSO9: to understand the importance and significance of the historical development of each philosophical tradition and attain knowledge from them.

PSO10: to develop a proper understanding and significance of the different kinds of traditions, social change, the role of philosophy in guiding each and every branches of social and political theories and also evaluating them.

PSO11: Acquiring the knowledge to develop the valid argumentation and developing the ability to listen and understand others view points and also to develop the ability and ability to establish their own views.

PSO12: to understand the ethical and moral implications and to learn applying them in all the spheres of life either academic or non-academic

PSO13: with the knowledge in philosophy students can attain the capacity to become either a good Philosopher, Counsellor, Academician, Politician and Social scientist. etc.

Course Outcomes (COs)

The Department follows the syllabus and curriculum structure as mandated by the affiliating University. During the three years of the B.A Philosophy Honours programme, spread over 6 semesters, 8 theory papers are taught. The semester wise distribution of the papers and their course outcomes are listed below.

Semester I	
Name of the paper: Epistemology and Metaphysics (PHIL- 11) Paper I	**Unit – I:Meaning and Method of Philosophy** CO1: From this unit the students will learn about What is philosophy, the definition, method and scope of philosophy., the relation between philosophy and science, philosophy and religion. **Unit -II: Sources of Knowledge** CO2 : Western: from this unit the students will learn the different theories of empiricism, rationalism and critical philosophy and their critical appreciation. Indian: From this unit the students will learn about Naya Pratyaksa and the different kind of Pratyaksa., Anumana - Distinguish between Svartha Anumana and Pararthaanumana, Nyaya syllogism, the different kinds of anumana, comparison between nyayaanumana and Aristotlean syllogism, Upamiti and Shabda Pramana. **Unit - III: Theories of Truth** CO 3: From this unit the students will learn about the coherence theory of truth, correspondence theory of Truth and the Pragmatic theories of truth and their application in philosophical theory formation along with their critical analysis. **Unit - IV: Theories of Reality** CO 4: From this unit the students will learn the different theories of reality such as-the different theories of Monism, Dualism, and Pluralism, Realism and Idealism and their critical analysis. **Unit – V: Metaphysical categories**

	CO5: from this unit the students will learn - the different interpretations of substance and causality and their critical appreciation, the different characteristics of Space and time.

Semester II	
Name of the paper: Logic Phil: 21 Paper II	After Studying this paper, the students will be able to get a broader concept about the main objective of logical reasoning. CO1. Students will acquire the basic concepts on logic, sentences, judgements, statements, propositions and arguments. CO2. Definitions: For example – stipulative, Lexical, Precising, theoretical, Persuasive, denotative, Connatative and ostensive definitions. CO3. Detect mistake in reason or reasoning in practice – Fallacy of relevance, Ambiguity and presumption. CO4. Translate ordinary languagearguments into standard form categorical syllogism, evaluate immediate inference and syllogism using the traditional square of opposition. CO5. Symbolic Logic: Value of symbols, truth functions, tautologous, contradictory and contingent statement forms. Testing Arguments form and Argument for validity by the method of truth table.

Semester III	
Name of the paper: Social and Political Philosophy Phil: 31 Paper III	**Unit I** : **Nature of Social and Political Philosophy** COI: from this unit the students will learn about the nature and scope of social and political philosophy, the relation between social philosophy and social philosophy

	relation between political philosophy and political science. **Unit II:Major Concepts** CO2: here the students will learn the relation between individualism and socialism, the characteristics of state and the nature of Sovereignty, the meaning and characteristics of Nation. **Unit III:Social and Political Ideas:** CO3 : from this unit the students will learn the ideas of what is called Liberty ,Equality, the meaning of Fraternity and the significance of justice. **Unit IV: Political Concepts** CO4: from this course content the students will learn about the theories of democracy, socialism, fascism and anarchism their merits and demerits. **Unit-V:Nature of transformation** CO5: from this unit the students will learn What is reformation? What is revolution? Under what conditions revolution is justified, rebellion, what is tradition and its kinds, distinguish between tradition and modernity, the factors responsible for social change

Semester IV	
Name of the paper: Indian Philosophy Phil: 41 Paper IV	**Unit i: Introduction** CO1: the course outcome of this paper is to learn the meaning of Indian Philosophy, the salient features of Indian Philosophy, distinction between the nastika (Heterodox) and the Astika (Orthodox) schools. **Unit-II: Carvaka,Buddhism and Jainism** CO2: the course outcome is to critically explain and examine Carvaka materialism, Pratitya- Samutpadakshanika-vada,Nirvana, anekantavada,ekantavada, the meaning of 'syat' and sapta-bhangi-nayaand the naya

	of jaina. **Unit-III: Samkhya and Yoga** CO3: What is Prakrti? State and Explain the characteristics of prakrti. What is Purusa? the characteristics of Purusa. plurality of Purusa, proofs for the existence of Prakrti and Purusa , the evolution of Prakrti and its teleology, What is Yoga, the eight limbs of Yoga. **Unit IV: Nyaya,Vaisesika and Mimamsa** CO4: from tis unit students will learn about Pratyaks (Nyaya), the different kinds of Pratyaksa. Savikalpa and nirvikalpa Pratyaksa, laukika and alaukika Pratyaksa, Anumana-distinction between Svartha Anumana and Parartha Anumana , the valid conditions of Shabda Pramana, Karma and Dharma of Mimamsa, Padartha - the different kinds of Padartha. Dravya as a kind of Padartha, the different kinds of Dravya, guna and its kinds, samanya,SamavayaAbhava and its kinds. CO5: the nature of Brahman in Samkara's advaita vedanta. Maya - the characteristics of maya, nature of Jagat, atman and moksa. The nature of Brahman in Ramanuja'sVisistadvaita Vedanta- cit and acit and moksa.

Semester V	
Name of the paper: History of Modern Western Philosophy Phil: 51 Paper V	The importance and usefulness of studying the history of modern western philosophy is that it is based on logical reasoning and as such it is more consistent than any other paper besides Logic. **Unit I - Descartes, Spinoza and Leibnitz:** Descartes, the father of modern western philosophy employed mathematical method into modern philosophy, his methods are deduction, by studying Descartes, the students learn to use their reasons before accepting anything as the truth. By study

	Spinoza the students understand that he is the meeting point between the western and eastern philosophy. Spinoza identifies God with Nature and as such there is so much similarity between Spinoza and Shankara. In Leibnitz's spiritualistic pluralism one connects psychology with physics. **Unit II - Locke and Berkeley:** The British empiricists lay more importance on sense perception rather than on innate ideas, with Locke the students learn to analyse their ideas derived from sense perception where some of our ideas are actually have no reality outside the mind. In Berkeley one learns the importance of God the infinite spirit. Though he is also an empiricist like Locke but for Berkeley there can be no ideas unless there is a mind to perceive them. **Unit III – Hume:** In Hume the most consistent empiricist than Locke and Berkeley, we seem to reach the climax of empiricism as a theory of knowledge, the importance of Hume is that he made realize that there is no permanent stuff or substance be it physical or mental. He even rejects metaphysics since we are limited to sense perception as to what we can know. Yet by way of criticising Hume, one understands that besides sense perception as human we do have our moral and religious consciousness which are a part of experience. **Unit IV – Kant** Kant the German critic is a great synthesizer where he synthesizes both empiricism and reason, where experience by themselves cannot be knowledge unless they are thought of and understood by the mind. Hence the importance of studying Kant is that experience cannot be taken for granted as a source of knowledge by itself, for experiences to be knowledge they must be thought of and understood by the

	understanding or the mind. **Unit V – Hegel** Hegel the German idealist, and like Kant in his dialectical method, he synthesizes thesis and an antithesis into a synthesis. In his Alsolute idealism one understands the similarities between him and Ramanuja in the east.

Semester V	
Name of the paper: Philosophy Of religion Phil: 52 Paper VI	Religion is a special aspect of human experience and therefore needs a philosophical explanation. The function of philosophy of religion is to determine the significance and value of human experience of religion. By studying this paper, students can come in acquaintance with the following concepts related to philosophy of religion, CO1. Definitions of religion, description about the nature as well as scope of philosophy of religion and its relation and differences to theology. CO2. Reason, Faith, Revelation and Mystic experience as the foundation of religious beliefs. CO3. The Judaic-Christian concept of God, The idea of God in Hinduism and Tribal religions and the arguments for the existence of God will be our major concern. CO4. The problem of suffering and liberation in Christianity, Hinduism, Buddhism and Jainism will imbibe in the students to think rationally about the various religious problems in our society. CO5. Students will be familiarisewith some socio-religious issues like Tolerance, Conversion and secularism.

Semester VI	
Name of the paper: Ethics Phil: 61 Paper VII	**Unit – I: Nature and Scope of Ethics** CO1: From this course content students will learn the definition and nature of moral philosophy, the scope of moral philosophy the nature of moral judgements: the subjective nature and the objective nature, the relation and the difference between ethics and meta-ethics. **Unit -II: Moral Concepts** CO2 : From this course content students will understand what id 'Good 'in the ethical terms, the different traditional theories of 'Good', can 'Good" be defined?, the meaning of 'Right', the meaning of 'Duty' ,the relation between 'Good' , 'Right' and 'Duty'. What is virtue- with reference of the Greek philosophers: Plato- the four Cardinal Virtues and Aristotle-moral and intellectual Virtues etc. **Unit - III: Ethical Theories** CO3: In this course content the students will learn the teleological theories of Hedonism- its meaning, origin, the psychological and moral development of Hedonism, the theory of Utilitarianism with reference to Bentham and J.S. Mill Along with their critical analysis. Ants Categorical Imperative – the disinclination between the hypothetical and categorical imperative, nature of 'good will', the three maxims will also be learnt by the students. **Unit - IV: Theories of Punishment** CO 4: From this course content students will learn the from this course content students will learn the three major theories of Punishment-the Preventive theory and its critical analysis, the Reformative theory and its critical analysis, the Retributive theory and its critical analysis. **Unit – V: Issues in Applied Ethics** CO5:From this course content students will learn the theory of Purusartha – dharma

	,Artha,kama and moksha and its application in ethical life, the doctrine of Niskama-karma of Bhagavad-Gita -its meaning ,purpose and destiny in achieving the ultimate goal of life i.e. moksa,Ahimsa -its historical development the Gandhian notion of Ahimsa and its significance in ethical conduct and self-realisation.

Semester VI	
Name of the paper: Existentialism Phil: 622 Paper VIII	Existentialism is an optional paper, the department opted this particular paper because it deals with man's predicament existing in the world of space and time. **Unit I:General Introduction** Existentialism actually does not have a domain or a subject matter as such because the individuals' predicaments are different not only in different societies but also within the society due to the uniqueness and traits of human personalities. However, it lays stress on human emotions like anxiety or despair, finitude, alienation, freedom, etc. As far as existentialism is concerned existence ends in death. **Unit II: Nietzsche** The importance of studying Nietzsche is exemplified in his doctrine of 'the will to power', as the saying goes if there is a will there is a way. The will to power is a driving force in achieving the goal. **Unit III Kierkegaard** Though Kierkegaard appears to be individualistic, yet his doctrine of "subjectivity is the truth. Truth is subjectivity" is very useful for every individual, to exist authentically one needs to find out the truth for himself for which he is going to live and die for. **Unit IV: Heidegger** The importance of learning Heidegger's philosophy is the awareness of our

	temporality in this world, as such one must not waste time in mundane things which Heidegger calls 'everydayness' , being potentially death each individual ought to understand human relationships and care for each other. **Unit V: Sartre** Sartre's concept of freedom is very useful because his freedom is not a pleasant experience but a yoke, by realization of one's freedom, he or she is also responsible and accountable of the consequences of the actions done. Another important topic in Sartre is his concept of 'bad faith' or self-deception because the realization that man's being is nothing he tries to fill up this nothingness with something which he is not. As far as existentialism is concerned man can create his own values.

BA IN POLITICAL SCIENCE

PROGRAMME SPECIFIC OUTCOME OF POLITICAL SCIENCE

After graduation the student will be able to

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

PSO 2: Understand the processes and dynamics of Indian government and politics. It also familiarize with the vital contemporary emerging issues of centre-state relations, political parties, emergence of new leadership at different levels, demand for autonomy movement, ethnic conflicts, evolving nature of the Indian Political System.

PSO 3: Familiarise with important theories and issues of international relations.

PSO 4: Acquaint with the diverse political systems especially the developed countries including UK, USA, Russia and China.

PSO 5: Sensitise with the sensitive peripheral state of India with special reference to Northeast India.

PSO 6: Understand the basic concept and ideological orientations of political science discipline.

PSO 7: Understand the contribution of the main traditions of Indian Political Thought.

PSO 9: Acquaint with the basics of International Law and the new trends in the realm of International law.

PSO 10: Understand the basic concept and issues concerning human rights and challenges.

PSO 11: Understand the women's issues and problems.

PSO 12: Develop a comprehensive understanding of the evolving role of international organisations and their impact on world politics.

PSO 13: Familiarises the relevance of Political Theory to contemporary times.

COURSE OUTCOME OF POLITICAL SCIENCE:

COURSE CODE: PSc 01:

CO1: Covers the nature and significance of Political Theory

CO2: It highlights the basic concepts, ideas and theories

C03: Brings forward the relevance of various perspectives and dimensions of Political Theory

CO4: Highlights the relevance of political theory to contemporary times.

COURSE CODE: PSc 02:

CO1: Points out the basic features of the government of UK, US, Russia and China. Also specifies the definition, nature, scope of comparative politics, different approaches to the study of comparative politics, traditional and modern approaches.

CO2: Outlines the role and functions of the executive.

CO3: Specifies different dimensions of legislative process like law making process, amendment etc.

CO4: Deals with different dimensions of judiciary, its role and functions, judicial review.

CO5: Deals with political parties and pressure groups.

CO6: Deals with the evolving role of women in the electoral politics.

COURSE CODE: PSc 03:

CO1: Provides a glimpse of the background of the Indian Constitution, its federal features, judicial review, judicial activism, parliamentary supremacy, concept of basic structure.

CO2: Covers the preamble, fundamental rights and directive principles of state policy, fundamental duties and amendment procedure.

CO3: Deals with federalism, centre state relations, centre state conflicts, regionalism, secularism.

CO4: Delineates the structure of government namely the legislature, executive and judiciary.

CO5: Highlights the political parties, electoral process and voting behaviour.

CO6: Deals with the historical impact of the colonial rule on India's policies and reforms.

CO7: Highlights the impact of Liberalisation, Privatisation and Globalisation has had on the Economic policies of India.

COURSE CODE: PSc 04:

CO1: Acquaints with the origin and growth of International Relations (IR) as an academic discipline, meaning and scope of IR, theories of IR-liberal and realist theories.

CO2: Covers the history of IR and highlights the great power system, imperialism, nationalism, the two world wars, the cold war and the post-cold war era.

CO3: Explains the concept of IR like national power, national security, human security, diplomacy, conflict and conflict resolution.

CO4: Underlines the working of UN system, collective security, peace keeping machinery, regional organisation (case studies of SAARC and EU)

CO5: Deals with contemporary issues like environment, feminism, self-determination, globalization and terrorism.

CO6: It highlights the major debates within the different theoretical paradigm.

COURSE CODE: PSc 05:

CO1: The classical tradition in political theory from Plato to Marx with a view to help understand how great thinkers explained

CO2: Analyses political events and problems of their times and prescribed solutions.

CO3: Interprets both the historical and philosophical perspectives

CO4: Helps to understand the universality of the enterprise of political theorising.

CO5: Social contract theories of Thomas Hobbes and John Locke.

CO6: Enlightenment political thought as reflected in the works of JJ Rousseau and JS Mill.

COURSE CODE: PSc 06:

CO1: Highlight the contribution of Indian Political Thinkers during the phase of National Struggle for freedom

CO2: Impact of Colonialism and emergence of social reform movements.

CO3: The views of the Moderate, Extremist and Revolutionaries

CO4: Political Ideas of Mahatma Gandhi from Satyagraha, Ahimsa, Sarvodaya and Swaraj

CO5: Highlights Religious and Secular nationalism

CO6: The importance of Caste representation

CO7: Highlights how Indian Socialism was incorporated into the Indian Constitution with contributions being made by Jawaharlal Nehru, M. N. Roy and Jayprakash Narayan.

COURSE CODE: PSc 07:

CO1: Discuss the geopolitical features, colonial legacy, heterogeneous character of north east society and its impact on politics, and non-tribal politics.

CO2: Deals with regionalism and sub-regionalism, demand for autonomous state and sixth schedule, demand for separate state.

CO3: Elaborates the politics of migration, identity movements, and insurgency and secessionist movements.

CO4: Covers electoral politics, emergence of Assamese middle class and their role in politics, role of political parties.

CO5: Outlines border disputes in North east India with reference to Assam, Nagaland, Meghalaya and Arunachal Pradesh.

COURSE CODE: PSc 08.3:

CO1: Highlights the genesis of International Organisation

CO2: Deals with humanity's quest for peace and international security

CO3: Helping the students assess the working of the United Nations covering its achievements and challenges.

CO4: Portrays the meaning, nature and development of Human Rights and deals with the approaches and perspectives of Human Rights.

CO 5: Outlines the role of the specialised agencies of the UN

CO 6: Points out the Pacific methods of settlement.

CO 7: Delineates the issues and challenges of the UN.

DEPARTMENT OF STATISTICS

1. Programme specific outcomes and course outcomes offered by the department are stated and displayed on the website of the college.
2. Hard Copy of the syllabus is available in the department for ready reference to the teachers and students.
3. The students are also made aware of the Programme and course outcomes at the beginning of the program and at the start of each semester.

Programme: B.Sc. Statistics (Elective and Honours)

Program Specific Outcome:

PSO-1: Acquire core knowledge of the basic concepts of statistics which include the major areas of probability theory, probability distributions, distribution theory, statistical inference, survey sampling, designs of experiments, applied statistics, mathematical methods, non- parametric inference and operations research.

PSO-2: Practical exercises done will enable students to analyze and interpret data and also to draw valid conclusions. This will enable students to face real time applications.

PSO-3: Apply the concepts of statistics, Operations Research, Probability theory, Time Series, Designs of Experiment, etc. in real life problems.

PSO-4: Understand the applications of statistics concept in other disciplines such as mathematics, physics, economics, etc.

PSO-5: Provides a platform for pursuing higher studies leading to Pst Graduate or Doctorate degrees.

Course Outcome

- **STEH – 1 Descriptive Statistics, Numerical Analysis and Probability (Theory & Practical)**

CO-1: Understand the concept of a statistical population and a sample from a population.

CO-2: Classification and tabulation of data. Different types of data. Diagrammatical and graphical representation of data.

CO-3: Measures of central tendency, Dispersion, Skewness and Kurtosis and Moments.

CO-4: Concept of correlation, correlation coefficients - Karl Pearson’s correlation coefficient, Spearman’s rank correlation coefficient, multiple and partial correlation coefficients, Intraclass correlation.

CO-5: Concept of Regression, Principle of least squares, Linear and curvilinear regression.

CO-6: Concept of finite difference, forward and backward operators, shift operator, difference table.

CO-7: Newton Gregory Forward and Backward Interpolation formula for arguments at equal intervals. Newton's Divided Differences Interpolation formula and Lagrange's Interpolation formula for arguments at unequal intervals.

CO-8: Numerical Integration, the general quadrature formula, trapezoidal rule, Simpson's one- third and three- eight formula.

CO-9: Concept of probability, different approaches to the theory of probability. Concept of events, mutually exclusive independent and exhaustive events. Sample space and its properties. Use the basic probability rules including addition and multiplicative laws, conditional probability and Bayes theorem.

CO-10: Gain knowledge on random variables. Distinguish between discrete and continuous random variables. Probability mass function and probability density function. Mathematical expectation of a random variable. Conditional expectation and variance.

- **STEH – 2 Probability Distributions and Statistical Inference (Theory & Practical)**

CO-1: Understand discrete and continuous distributions and identify their characteristics. Students will be able to identify the type of statistical situation to which different distributions can be applied. Use the different distributions in solving statistical problems.

CO-2: Basic idea of Box Plot, QQ Plot and PP Plot.

CO-3: Gain knowledge in sampling distribution theory and their applications in statistical inference. Chi- square, t and F distribution, Chebyshev's inequality, Weak Law of Large numbers and the Central Limit Theorem.

CO-4: Gain knowledge in the concepts of Theory of estimation and distinguish various types of estimation. Know the properties of estimators and construction of point and interval estimators.

CO-5: Understand the process of hypothesis testing and its significance. Distinguish various test used in sampling theory. Use the different test in solving statistical problems.

- **STEH-3 Categorical data, Survey Sampling and Design of Experiment (Theory & Practical)**

CO-1: Gain knowledge on Categorical data. Consistency of categorical data. Know the association and independence between attributes.

CO-2: Understand basic concepts of survey sampling, basic principles in sampling, Simple random sampling, systematic sampling, stratified sampling.

CO-3: Understand the concepts of analysis of variance and appropriately interpret the results of analysis of variance test.

CO-4: Have a good understanding of the design of experiments and analyse the data they yield. Completely randomised design, Randomised block design, Latin square design. Factorial experiments with two levels.

- **STEH-4 Applied Statistics (Theory & Practical)**

CO-1: Understand the basic concepts of vital statistics. Mortality rates, fertility rates and their measurements. Have a basic idea about migration and population projection.

CO-2: Understand the concepts of quality control, control charts for variables and attributes. Know about the different types of control charts for variables and attributes and their construction. Producer's and consumer's risk, Acceptance sampling plans.

CO-3: Acquire knowledge on Index numbers and their applications. Have a clear understanding about the different indices, criteria of a good index, cost of living index number and calculate indices from given data.

CO-4: Understand the concepts of time series, the different models, measurement of trend and seasonal variations.

CO-5: Gain knowledge about demand analysis. Law of demand and supply. Price elasticity of demand, Pareto distribution, Lorenz curve and Gini's coefficient.

CO-6: Know about Indian Official Statistical system. The different methods of collection of official statistics and their reliability. Principal publications and the various official agencies responsible for data collection and their main functions.

- **STEH – 51 Mathematical Methods and Distribution Theory (Theory & Practical)**

CO-1: Gain knowledge on numerical differentiation based on Newton's forward and backward interpolation formula. Numerical integration – Weddle's rule, Euler's formula.

CO-2: Understand different methods of solving algebraic and transcendental equations.

CO-3: Understand concepts of partial derivatives, maxima and minima, applications of Lagrangian multipliers. Multiple integrals of Jacobian of transformation, Beta and Gamma integrals.

CO-4: Gain knowledge about concepts of linear algebra. Linear system of equations. Gauss Jordan Reduction method. Vector spaces and subspaces, Linear dependence and independence, rank of a matrix and applications. Eigen values and vectors, Caley Hamilton Theorem, Quadratic form and its types.

CO-5: Gain knowledge on random variables and expectations. Distribution functions and their properties. Properties of expectation of sums of Random variables. Conditional expectation. Generating functions- their properties and applications, characteristic function. Computing MGF by conditioning.

CO-6: Understand different discrete and continuous distributions, their properties and applications.

CO-7: Gain knowledge in derivation and independence of sampling distribution of sample mean and variance in random sampling from different distributions. Chi- square, t and F distribution – their properties and derivations.

CO-8: Analyse statistical data using MS-Excel.

- **STEH – 52 Linear Models, Regression, Deign of Experiments and Operations Research (Theory & Practical)**

CO-1: Understand basic concepts of linear models. Theory and estimation of linear models. Gauss Markov Theorem and linear model.

CO-2: Understand simple and multiple linear regression models. Violation of usual assumptions concerning normality, homoscedasticity and collinearity. Diagnostics using probability plots. Corelation ratio and co relation index.

CO-3: Gain knowledge about analysis of variance – two-way classification with m observations per cell under fixed, random and mixed effects model.

CO-4: Factorial experiments with two and three levels. Complete and partial confounding. Analysis of covariance.

CO-5: Understand the basic concepts of Operation research. Formulation of a linear programming problem. Obtain graphical solutions to a linear programming problem.

CO-6: Represent transportation and assignment problems as LPP, solve transportation and assignment problems using different methods.

CO-7: Analyse statistical data using MS-Excel.

- **STEH – 61 Statistical Inference (Theory & Practical)**

CO-1: Gain knowledge on Point estimation. Properties of estimators and mean square error. Minimum variance unbiased estimators, Rao- Cramer Lower Bound of variance and their results. Sufficient conditions for consistency. Sufficient statistic and optimal estimators. Rao- Blackwell theorem.

CO-2: Understand different methods of estimations. Estimating point estimators using different methods. Construction of confidence interval for parameters of different distributions.

CO-3: Gain knowledge on testing of hypothesis. Different types of hypothesis. Statistical tests, types of error, size and power of a test, Most powerful (MP), Uniformly most powerful (UMP) and unbiased test.

CO-4: Understand Neymann- Pearson Lemma and its applications in testing of hypothesis regarding different distributions. Power functions of UMP test. Likelihood Ratio test. Sequential test- Wald SPRT. Approximate OC and ASN functions for test regarding parameters of different distributions.

CO-5: Understand Large sample test. Use of central limit theorem to obtain large sample tests for binomial proportions and means of populations, etc. Related confidence intervals.

CO-6: Analyse statistical data using MS-Excel.

- **STEH – 62 Survey Sampling and Non parametric Inference (Theory and Practical)**

CO-1: Gain knowledge about linear systematic sampling, population with linear trends, estimation of variance using interpenetrating sub-samples (IIPS). Circular systematic sampling, estimation of parameters, estimation of variance using different methods under SRSWR and SRSWOR.

CO-2: Understand cluster sampling, single stage cluster sampling under SRSWR and SRSWOR. Estimation of parameters. Estimation of variance in terms of intraclass correlation.

CO-3: Two stage sampling with equal size first stage units SRSWR at both stages, SRSWOR at both stages, SRSWR at first and SRSWOR at second stage, SRSWOR at first stage and SRSWR at second stage. Estimation of parameters.

CO-4: Understand basic concept of order statistics. Derivation of distribution of order statistics from Uniform distribution, joint distribution of two order statistics, distribution of functions of order statistics.

CO-5: Difference of parametric and non- parametric test. Area of applications. Testing of hypothesis using Non-Parametric tests like sign test, Wilcoxon rank test, Mann- Whitney test, etc. and ability to use them judiciously for the testing of given data.

CO-6: Analyse statistical data using MS-Excel.