



GOVERNMENT COLLEGE KARIAVATTOM

Affiliated to University of Kerala
2022-2023

UNDER-GRADUATE PROGRAMMES (B.Sc.) Programme Outcomes (POs), Programme Specific Outcomes (PSOs) & Course Outcomes (COs)

PROGRAMME OUTCOMES

PO1: Critical Thinking - Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid and looking at our ideas and decisions (intellectual, organizational and personal) from different perspectives.

PO2: Problem Solving - Identify, formulate, conduct investigations and find solution to problems based on in-depth knowledge of relevant domains.

PO3: Communication - Speak, read, write and listen clearly in person and through electronic media in English/language of the discipline, and make meaning of the world by connecting people, ideas, books, media and technology.

PO4: Responsible Citizenship - Demonstrate empathetic social concern and the ability to act with an informed awareness of issues.

PO5: Ethics - Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6: Self-directed and Life-long Learning - Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

PO7: Effective Citizenship

PO8: Environment and Sustainability

PO9: Global Perspectives

PROGRAMME 1: B.Sc. Biochemistry

PROGRAMME SPECIFIC OUTCOMES

PSO1: Students will gain the ability to understand diverse biological processes taking place in living organisms at the molecular level.

PSO2: Students will get to learn about the importance and applications of Biochemistry in health and nutrition.

PSO3: Acquire practical laboratory skills that will be beneficial for a future career in the interdisciplinary areas of life sciences.

COURSE OUTCOMES

BC1141 Perspectives, Methodology & Biomolecules-I

- Elicit the concepts of science
- Describe the evolution and scope of biochemistry as a science discipline.

- List out the different experimental approaches to study biochemical processes.
- Prepare solutions of different concentration and pH.
- Classify and characterize carbohydrates and lipids.

BC1221 Biomolecules-II & Bioinformatics

- Elaborate the composition of proteins and their function.
- Detail the importance of genetic information carrier molecules in life.
- Recognize the scope and application of Bioinformatics.
- Perform statistical investigations related to biochemical problems.
- Identify application of information technology in biology.

BC1341 Cellular Biochemistry

- List out cell organelles and describe their structure and function.
- Elaborate the different types of transport systems across cell membrane.
- Explain types of cell division
- Outline the characteristics of cancer cells and mechanisms involved in cancer biology.
- Detail on the mechanism of interaction between cell and its environment.
- Classify enzymes; describe types of enzyme inhibition and regulation.

BC1441 Qualitative Analysis of Biomolecules

- Qualitatively analyse the type of biomolecule.
- Identify the subclass of each biomolecule by schematic analysis

BC1541 Physiology & Immunology

- Explain hemopoiesis and biochemical basis of blood group classification.
- Elaborate on the transport of gases, acid base and water balance in the body.
- Remember structure of muscle, neuron and bone.
- Classify hormones and explain the functions of hormones.
- Describe various aspects in basic immunology
- Identify the applications of various techniques involved in immunology.

BC1542 Bioenergetics and Carbohydrate Metabolism

- Describe the bioenergetics of metabolic pathways.
- Elaborate the reactions and regulation involved in the metabolism of carbohydrates.
- List out the inborn errors of carbohydrate metabolism.
- Enumerate the link between ETC and energy production in plant and animal cells.
- Elicit the mechanism of energy production in carbohydrate metabolism.

BC1543 Food Science

- Elaborate on the importance of human nutrition.
- Describe the chemical composition of different types of food.
- Explain the various food preservation techniques employed.
- Identify the common adulterants in food.

- Gain knowledge about the role of microorganisms in food and nutrition
- Explain the importance of food safety and management systems.

BC1544 Classical and Molecular Genetics

- Give an account of Mendelian and non- Mendelian genetics.
- Predict the type of inheritance of a trait/disease using pedigree analysis.
- Explain the organization of chromatin and events during gene expression.
- Illustrate the consequences of different types of mutations and DNA-repair systems
- Depict the concepts of gene regulation in prokaryotic cells
- Describe the methods involved in rDNA technology.
- Provide insight into the molecular and cell-based methods used in the field of biology
- Understand several modern molecular methods to elucidate molecular and genetic questions.

BC1545 Quantitative Analysis of Biomolecules

- Student will be able to quantitatively analyze different biomolecules in a given test sample.

BC1641 Clinical Biochemistry

- List out the methods of clinical laboratory management and laboratory safety.
- Describe the principle & procedure for studying clinical parameters used for diagnosis.
- Detail the basic concepts of microbiology and pharmacology

BC1642 Metabolism-II

- Describe the metabolism of lipids, nucleic acids, amino acids and heme.
- Explain the role of enzymes involved under physiological and pathophysiological conditions.
- List out the inborn errors of metabolism of above-mentioned biomolecules.
- Detail the processes involved in biological nitrogen fixation.
- Enumerate the important detoxification processes in the body.

BC 1643 Practical: Clinical Biochemistry and Enzymology

- Quantitatively analyze parameters of clinical significance in blood and urine.
- Detect the presence of abnormal constituents in the urine sample.

BC 1644 Practical: Food Analysis

- Quantitatively estimate the specific biomolecule in any given food sample.
- Detect the presence of adulterants in different food samples.

BC 1661.1 Analytical Biochemistry

- Perform phytochemical analysis.
- Identify the importance and impact of pesticides in life
- Detect food adulteration

- Elaborate standards for respective category of water
- Recognize the effect of toxic metals in foods
- Analyze toxicants in biological samples

BC 1661.2 Immunology and Immunological Techniques

- Describe various aspects in basic immunology
- Identify the applications of various techniques involved in immunology.

BC 1551.1 Open Course: Clinical Diagnosis of Common Diseases

- Explain the importance of each clinical parameter studied.
- List out the parameters measured under various disease conditions.
- Gain knowledge about the normal levels of different clinical parameters
- Identify the diseases by interpreting the variations in clinical data.

BC 1551.2 Lifestyle Diseases

- Enumerate the different causes and risk factors of life style diseases like atherosclerosis, hypertension, stroke, diabetes, obesity, nephritis and liver diseases.
- List out the methods to diagnose the diseases and gain a basic knowledge regarding interpretation of the test results.
- Spell out the methods of prevention, treatment and management of the diseases.
- Identify healthy and unhealthy life habits and adopt better life style.

PROGRAMME 2: B.Sc. Biotechnology

*** The syllabus for B.Sc. Biotechnology Programme is currently not outcome based.**

PROGRAMME 3: B.Sc. Computer Science

PROGRAMME SPECIFIC OUTCOMES

PSO1: Develop skills showcasing critical thinking, problem solving abilities and independence.

PSO2: Apply integrated knowledge to implement real-life tasks efficiently by mastering in different programming languages to enhance computing capabilities.

PSO3: Acquire adequate knowledge in Computer Networks, Database Systems, Software Engineering, Theory of Computing and other state-of-the-art areas.

COURSE OUTCOMES

CS1121 Computer Fundamentals and Programming in C

- Remember the basics of computer
- Understand the structure of program writing
- Apply control structures and pointers
- Analyze user defined functions
- Understand dynamic memory allocation
- Understand string handling functions

CS1132 Digital Electronics

- Remember the basic concepts of electronics
- Familiarise the concept of different number systems

- Understanding the properties of logic gates
- Apply different techniques and theorems to simplify the SOP forms
- Analyse the characteristics of different combinational logic circuits.

CS1122 Value Education

- Remember the basic concepts on NSS and NCC
- Understand the impacts of disaster management in different environments.
- Understand the features of Constitution of India

CS1141 C Programming Lab

- To familiarise programs in C.

CS1133 Digital Electronics Lab

- To familiarise the components in digital electronics

CS1221 Environmental Studies

- Understand environmental systems
- Understand the biodiversity and conservation concepts
- Remember concepts of biodiversity and conservations
- Understand natural systems and resources
- Apply pollution management techniques

CS1241 Data Structures

- Remember purpose of Data Structures
- Understand different Data Structures
- Apply programming languages
- Analyse working of different data structures
- Evaluate expressions
- Create different Data Structures

CS1242 Computer Architecture and Microprocessors

- Remember the basic concepts of computers.
- Understand the functional units of a standard PC and its working.
- Understand the architectural features of 8086 processor.
- Create assembly language programs for 8086 processor.
- Apply the tools debug, TASM/ MASM.

CS1243 Data Structures Lab

- To familiarise various data structures.

CS1244 Assembly Language Programming Lab

- To familiarise 8086 programs

CS1341 Programming in Java

- Understand the java programming and oops concepts.
- Understand the concepts of Interface, exception handling, threading, and package
- Understand the basic concepts of Applet, Networking.
- Idea to approach and use a new package.

CS1342 Software Engineering

- Understand the importance of having a process for software development.
- Familiarize with various software testing techniques and tools.
- Apply various models in the software development projects.
- Analyze the process of software development

CS1343 Operating Systems

- Understand working of various Operating Systems
- Apply constrained resource allocation, process scheduling and memory management techniques
- Evaluate synchronization of processes and protection of an Operating System
- Analyze salient features available to various Operating Systems

CS1344 Database Management Systems

- Understand the concept of database.
- Develop skills to design an ER diagram.
- Create database using SQL and perform operations in SQL.
- Familiarize the management of concurrent transactions.
- Apply the design concepts and normalization in database easily.

CS1345 Design and Analysis of Algorithms

- Develop and analyze new algorithms.
- Analyze the complexity of algorithms
- Understand good algorithms among multiple solutions for a problem.
- Have better knowledge on fundamental strategies of algorithm design and awareness on algorithm design strategies
- Implement some typical algorithms

CS1346 Java Programming Lab

- To familiarize the Java programs

CS1347 DBMS Lab

- To familiarize the SQL queries in MySQL

CS1441 System Software

- Understand different System Software.
- Analyze SIC machine architecture with its instruction sets and capable to do programming.

- Illustrate machine dependent, independent assemblers and macro processors.
- Remember the functions of loaders, linkers and illustrate machine dependent loaders and independent loaders.
- Understand the functions of compilers and illustrate the machine dependent and independent compilers.

CS1442 Web Programming and PHP

- Understand the basic skills in moderately complex use of the following tools/scripts/languages: HTML, DHTML, CSS, Javascript.
- Apply the appropriate web tools/languages for creating state-of-the art websites
- Understand the current trends and styles in web design and applications
- Apply PHP in web designing

CS1443 Computer Networks and Security

- Remember various network technologies, design issues and characteristics
- Understand the purpose of computer networks and the basic issues in information security
- Apply the use of layer architecture for networking systems, information security measures
- Analyze the concept of different models of network and the working of various ciphers
- Evaluate data link controls and Information Security policies
- Create awareness on different networking protocols and information security policies

CS1444 Computer Graphics

- Compare various graphics devices
- Apply various transformations to 2D and 3D graphics objects
- Analyze algorithms for clipping
- Classify various projections of 3D objects
- Explain current trends in computer graphics

CS1445 Minor Project

- Plan And Estimate a Project
- Design And Analysis of a Problem
- Coding / Implementation of a Software

CS1446 Computer Graphics Lab

- To familiarise the drawing, clipping algorithms in Computer Graphics

CS1447 Web Programming and PHP Lab

- To familiarise web programming using PHP

CS1541 Python Programming

- Remember the concepts of python programming

- Understand data types and differences
- Apply CGI programming
- Analyze the concepts of database programming in python
- Evaluate the usage of Python package installer PIP
- Create programs using libraries such as Flask, SQL Alchemy, Pandas, Numpy etc..

CS1542 Artificial Intelligence

- Remember features of AI and knowledge-based systems
- Understand basic parsing techniques
- Apply search and control strategies
- Understand expert systems
- Evaluate the performance of various searching algorithms
- Evaluate different knowledge representation schemes

CS1543 Free and Open Source Softwares (FOSS)

- Remember FOSS concepts, features
- Understand Linux OS
- Apply shell programming
- Analyze various Linux commands
- Evaluate conditional and looping statements
- Create user defined function

CS1551.1 Object Oriented Analysis and Design

- Remember object oriented features
- Understand Object Oriented System Development
- Apply Unified Approach
- Analyze various UML diagrams
- Evaluate objects static and dynamic model
- Create UML diagrams for any system

CS1551.2 Embedded Systems

- To understand the basic concepts of Embedded System.
- To familiar with the architecture of Embedded System.
- To understand the Embedded Operating system and Programming languages.
- To analyze the process of Embedded Software Development process.
- To familiarize the various applications of Embedded System.

CS1551.3 Cloud Computing

- Remember the basics of cloud computing
- Understand the main concepts and key technologies of cloud computing.
- Apply the concept of virtualization in the cloud computing
- Analyze the evolution of cloud from the existing technologies.
- Evaluate and choose the technologies for implementation and use of cloud.

- Create services using cloud computing

CS1561.1 Digital Marketing

- Understand different digital marketing types
- Understand the main concepts and key technologies of digital marketing.
- Remember the concept of e-banking, cyber security
- Analyze the evolution of digital marketing from the existing technologies.
- Analyze services using digital marketing

CS1561.2 Internet and WWW

- Understand the basic concepts of Networks.
- Learn the working of Internet.
- Analyse different search engines and its working
- Familiarise Network Protocols and WWW.

CS1561.3 Impact of Social Media Networks

- To understand the types of social media networks and its uses.
- To learn the impact of social media on society & commerce
- To analyse the impact of social media on work, training & development and on relationships
- To familiarize challenges of social media in terms of privacy, security & health

CS1544 Python Programming Lab

- To familiarise the programming in Python

CS 1545 Free and Open Source Software (FOSS) Lab

- To understand Linux commands and desktop components

CS1641 Data Analytics

- Remember purpose of data analytics
- Understand the principles and tools of data analytics
- Apply different analytical theories and methods
- Analyze text data

CS1642 Internet of Things (IoT)

- Remember the purpose of computer networks and its developments
- Understand various network technologies, design issues and characteristics
- Apply the use of layer architecture for networking systems
- Analyze the working of different models of network and data communication
- Evaluate data link controls
- Create different networking protocols

CS1643 Cyber Security

- Understand the features, development and use of information systems
- Identify the various types of information system risks, threats and pitfalls.

- Analyze the security approaches applied.
- Compare the approaches in the context of achieving security goals.
- Create awareness about cyber laws and cyber crimes and cyber ethics.

CS1661.1 Machine Learning

- Remember applications of machine learning
- Understand different learning techniques
- Apply clustering of raw data
- Analyse the performance of classification methods
- Evaluate hierarchical methods
- Create a semi supervised learning model

CS1661.2 Blockchain Technology

- Understand the concepts behind Blockchain technology
- Analyze the challenges in practical uses
- Evaluate the various implementation criteria
- Remember the new components of Blockchain technology

CS1661.3 Digital Marketing

- Understand different digital marketing types
- Understand the main concepts and key technologies of digital marketing.
- Remember the concept of e-banking, cyber security
- Analyze the evolution of digital marketing from the existing technologies.
- Analyze services using digital marketing

CS1644 Major Project

- CREATE an industry-standard project through a real-life project work under time and deliverable constraints, applying the knowledge acquired through various courses.
- To provide an opportunity to apply the knowledge gained through various courses in solving a real life problem.
- To provide an opportunity to practice different phases of software/system development lifecycle
- To introduce the student to a professional environment and/or style typical of a global IT industry
- To provide an opportunity for structured team work and project management
- To provide an opportunity for effective, real-life, technical documentation
- To provide an opportunity to practice time, resource and person management.

PROGRAMME 4: B.Sc. Chemistry & Industrial Chemistry

* The syllabus for B.Sc. Chemistry & Industrial Chemistry Programme is currently not outcome based.

PROGRAMME 5: B.Sc. Geography

PROGRAMME SPECIFIC OUTCOMES

PSO1: Attain a common level of understanding in basic principles of Geography and have a strong foundation in earth related sciences for their future courses.

PSO2: Equip themselves in gathering spatial information, analyse, synthesize and to suggest solutions to geographical problems.

PSO3: Attain highest academic standards in undergraduate level.

PSO4: Develop their analytical skills through a wide range of expertise in handling applications of Geography by their training acquired through field work and laboratory work.

COURSE OUTCOMES

GG 1141 Fundamentals of Geomorphology

- Understand origin and evolution of Universe/Solar System
- Critically analyse Continental Drift and Plate Tectonics
- Identify major earthquake and volcanic zones of the Earth
- Appreciate and evaluate various endogenic processes
- Critical understanding of exogenic processes and soil formation

GG 1142 Practical Paper: Physical Geography

- Understand Latitudes and Longitudes
- Identifies the various erosional and depositional landform features
- Analyses and interprets weather station models
- Illustrates the relief of the ocean floor and ocean currents
- Explore the uses advantages of online maps daily life

GG 1221 Climatology & Oceanography

- Understand the global atmospheric circulation
- Critically examine the distribution of pressure systems and winds
- Identify different forms of condensation, precipitation and tropical weather systems
- Appreciate the bottom topography of oceans
- Critically analyse the environmental issues associated with Oceans

GG 1341 Cartography

- Appreciates the historical evolution of maps
- Acquires skills in enlargement and reduction of maps
- Understanding the principles of Map Design
- Evaluates the maps prepared for various users/purposes
- Familiarizes the latest technologies used in Cartography

GG 1342 Practical Paper: Cartographic Techniques

- Understanding the concept of scales
- Acquiring skills in using magnetic compass
- Differentiate between Projected and Geographic coordinate Systems
- Acquire skills in geometrical construction of map projections

GG 1441 Human Geography

- Critical understanding of the nature and scope of Human Geography through a thorough appreciation of the various approaches, and contributions made by renowned geographers

- Familiarize with basic concepts and models of spatial interaction and thereby analyze the factors controlling spatial interaction and how it modifies the earth's surface
- Evaluate how culture and its components diffuse, modify and restructure the earth's surface
- Holistic understanding of the major languages and religions
- Enhance the understanding of human settlements through a critical appraisal of its types, patterns, functions and problems.

GG 1541 Physical Geography of India

- Understanding the physical characteristics of India
- Acquiring knowledge regarding the drainage systems of India
- Examines the concept of Monsoon and its causes
- Understanding the importance and status of natural resources in India
- Acquiring comprehensive knowledge about the environmental issues

GG 1542 Economic and Social Geography of India

- Understanding the history of economic development in India
- Developing a cognitive understanding of the distribution of resource potentials in the country
- Developing skills in mapping the spatial distribution of various resources
- Critically analyses the demographic profile of India

GG 1543 Fundamentals of Remote Sensing and GIS

- Understand the principles of Remote Sensing system
- Apply GIS and remote sensing data in various areas of Geographical and Environmental Studies
- Interpret satellite images and aerial photos with the help of elements of visual image interpretation
- Conduct Field surveys using GPS system
- Integrate data from various sources for GIS analysis

GG 1544 Practical II: Techniques of Data Collection

- Shall become aware of various primary data collection techniques
- Will have acquired the skill of collecting data and organising them using various methods
- Will be able to prepare an effective questionnaire
- Will enhance the skill to find directions and make rough estimate of distances during field survey
- Will develop the skill to use GPS for finding location and altitude of places.

GG 1545 Practical – III: Map Reading and Spatial Information Techniques

- Will acquire skills in representing relief using contours
- Identify Grid references, conventional signs and symbols used in topographical maps

- Interpret physical and cultural features represented in topographical maps
- Comprehend techniques of estimating slope from maps
- Will acquire knowledge on Georeferencing and Digitizing

GG 1551.1 Open Course: Geography of Tourism

- Analyses various types of tourism and their geo-backup
- Examine the elements of tourism and its significance in the growth and development of tourism
- Evaluate the significance of tourism in the cultural, social and economic milieu of geographic spaces
- Recognize the role of various travel agencies in tourism
- Understand the spatial dimensions of tourism attractions at state and local level

GG 1551.2 Open Course: Physical Geography

- Will comprehend types of major relief features and geomorphic forces of the earth
- Evaluate the physical processes responsible for landform development
- Analyze factors affecting atmospheric processes and marine environment
- Acquire in-depth understanding of environment and ecosystem

GG 1551.3 Open Course: General Geography

- Understand the basics of Geography for competitive examinations
- Evaluate the physical processes responsible for landform development
- Critically analyse physical and human dimensions of Geography
- Acquire in-depth understanding of environment and resources of the world

GG 1551.4 Open Course: Bio-Geography

- Acquiring knowledge regarding the basics of Bio-Geography
- Congregating the awareness of evolution of life on earth
- Understanding the distribution of plant life on earth
- Identifying various types of environmental degradation
- Awareness regarding the biomes of earth

GG 1641 Geography of Kerala

- An in-depth knowledge on evolution and physical settings
- Appreciate Agricultural development of Kerala
- Evaluate Mineral and Power Resources of Kerala
- Analyse Industrial Development of the state
- Understanding Population composition and transportation networks of Kerala

GG 1642 World Regional and Economic Geography

- Understand the concept of a Region and classify methods of delineation of regions
- Identify major Natural Regions and differentiate their physical and economic characteristics

- Classify Natural Resources and understands the concept of Sustainable Development
- Analyze the role of MNC's and TNC's in globalizing world trade.

GG 1643 Practical Paper IV: Representation and Interpretation of Geographic Data

- Ability to represent socio-economic data through graphs and diagrams
- Acquire skills to represent climatic data
- Develop skills to analyse and interpret Weather maps
- Acquire basic awareness on Computers and MS Office applications

GG 1644 Practical Paper V: Foundation to Surveying and Levelling

- Understand various land surveying techniques
- Sketch a field plan during ground-based survey
- Carry out survey based on principles and procedures
- Estimate the area and relative height of field objects
- Assess the pros and cons of various surveying techniques
- Prepare tour report with critical analysis on field experience

GG 1661.1 Environmental Geography & Disaster Management

- Gains knowledge about concept, scope of Environmental Geography and components of environment
- Develop an idea about human- environment relationships
- Acquiring knowledge on environmental programme and policies
- Understanding the definition, classification of Hazards and disasters
- Acquires an idea about Disaster management cycle

GG 166.2 Fundamentals of Photogrammetry

- Understands and explains the basic concepts and principles aerial photography, types of aerial photographs and their scale; understand and explain the flight planning and procedures of aerial photography; describe the errors and rectifications in aerial photography
- Understands and describes the geometrical characteristics of aerial photographs, their measurements and the instrumentations.
- Understand and explain stereo-photogrammetry, the basics of Analytical Photogrammetry and the concept of Rotation Matrix
- Understands and describes the different aspects of Digital Photogrammetry; the concepts and procedures and the instrumentations; get knowledge of the various outputs

PROGRAMME 6: B.Sc. Physics & Computer Applications

PROGRAMME SPECIFIC OUTCOMES

PSO1: Conceptual understanding of Physics and its practical applications and scope in the present world.

PSO2: Analyzing the theory part with practical experiments, interpretation of experimental results, finding out errors, suggestions to improve the errors.

PSO3: Develop and construct practical model systems from their conceptual knowledge.

PSO4: Acquire conceptual understanding of properties of matter, fundamentals of mechanics and their practical applications.

PSO5: Acquire knowledge about basics of thermodynamics and working of heat engines and their practical applications.

PSO6: Acquire the theoretical basis of electrodynamics, Magnetism, Super conductivity, Classical, Statistical and Relativistic Mechanics, Optics, Solid State Physics, Quantum Mechanics, Nano technology.

PSO7: Distinguish Microscopic Macroscopic Systems and statistical distributions.

PSO8: Acquire conceptual understanding of Physics to General real-world situations.

PSO9: Integrate the Quantum Mechanics to understand the fundamentals of other branches of Physics such as Vibrational, Raman, Electronic, Resonance Spectroscopy.

PSO10: Identify possible atomic and molecular energy levels and transitions and predict the existence of new elements.

PSO11: Develop an idea regarding X-rays, and different spectroscopic techniques.

PSO12: Acquire the knowledge of the basic idea about Electronics, Digital Electronics and working of different electronic components.

PSO13: Apply the Lagrangian and Hamiltonian formalisms to solve various dynamical problems which involve constraints.

PSO14: Basic understanding and concepts of the causes, effects, and control of various types of environmental pollution.

PSO15: Students will use the knowledge of Mechanics to describe the motion of objects in different force fields.

PSO16: Develop Basic idea about linear and non-linear optical phenomena and their practical application in real world.

PSO17: Use advanced computer language for problem solving and practical applications.

PSO18: Acquire knowledge about the concept of project and methodology in research.

PSO19: Develop the ability to collaborate with peers in a scientific/lab atmosphere.

COURSE OUTCOMES

PC1121 Mechanics, Thermodynamics & Properties of Matter

- Understand the Moment of inertia of various bodies and apply this to find moment of inertia of rigid bodies.
- Interpret the flavor of classical fields from oscillations.
- Apply the laws of thermodynamics to various processes and systems. Solve problems related to thermodynamic systems.
- To develop a fundamental understanding of entropy in different processes.
- Understand the basic principles of heat transfer.
- To understand the basic ideas of moduli of elasticity. Apply basic concepts of properties of matter in solving problems efficiently. To find practical applications of moduli of elasticity in different situations.
- Understand the concepts of surface tension and viscosity.

PC1171 Computer Fundamentals and Organization

- Remember the basic concepts of computers.
- Understand the functional knowledge about PC hardware, operations and concepts.
- Understand the functional units of a standard PC and its working.

- Understand the memory organization in a computer.

PC1221 Programming in C

- Remember the basics of computer.
- Understand the structure of program writing.
- Apply control structures and pointers.
- Analyze user defined functions
- Evaluate dynamic memory allocation.
- Create string handling functions.

PC1242 Practical: Mechanics, Properties of Matter, Heat and Acoustics

- Familiarize with the precautions and steps of systematic recording of an experiment.
- Understand multiple experimental techniques for determining physical quantities.
- Develop skill in setting up of apparatus for accurate measurement of physical quantities.
- Apply and illustrate the concepts of mechanics, heat and acoustic experiments.

PC1341 Electrodynamics and Circuit Theory

- To define, explain and illustrate fundamental concepts from electricity, magnetism, electromagnetism and circuit theory.
- To apply fundamentals laws like Gauss's law etc. to solve and analyze problems and formulations from electricity, magnetism and electrostatics.
- To explain and illustrate alternating current and analyze AC circuits.
- To illustrate and design electric circuits using circuit theory.

PC1371 Microprocessors

- Remember the basic concepts of computers.
- Understand the functional units of a standard PC and its working.
- Understand the architectural features of 8086 processor.
- Create assembly language programs for 8086 processor.
- Apply the tools debug, TASM/ MASM.

PC1372 Data Structures

- Remember purpose of Data Structures.
- Understand different Data Structures.
- Apply programming languages.
- Analyze working of different data structures.
- Evaluate expressions.
- Create different Data Structures.

PC1441 Classical Mechanics and Theory of Relativity

- Familiarize with Newtonian Mechanics
- Understand various theories of classical mechanics
- Solve mechanical problems using Lagrangian Dynamics

- Solve mechanical problems involving Central Forces including planetary motion.
- Solve mechanical problems using Hamiltonian Dynamics.
- Recognize the limitations of Classical Physics to explain certain physical phenomena.
- Familiarize with nonexistence of ether medium and postulates of special theory of relativity.
- Understand Galilean and Lorentz transformations.
- Apply theory of relativity to find physical quantities in different situations.

PC1442 Optics

- Get knowledge on the basic concepts of light such as Interference, Diffraction, Dispersion and Polarisation.
- Study the production and detection of polarized light.
- Understand the working principles of laser and optical fibers.
- Extend their knowledge in explaining different phenomena of light based on interference and diffraction.
- Solving problems related to refractive index, numerical aperture and acceptance angle.
- Describe the concept of laser and optical fibers.

PC1471 Software Engineering

- Understand the importance of having a process for software development.
- Familiarize with various software testing techniques and tools.
- Apply various models in the software development projects.
- Analyze the process of software development.

PC1472 Python Programming

- Remember the concepts of python programming.
- Understand data types and differences.
- Apply CGI programming.
- Analyze the concepts of database programming in python.
- Evaluate the usage of Python package installer PIP.
- Create programs using libraries such as Flask, SQLAlchemy, Pandas, numpy etc..

PC1443 Practical: Electricity and Magnetism

- Understand and differentiate between different circuit elements and their use in a circuit.
- Familiarize with the precautions and steps of systematic and accurate recording of an experiment.
- Understand multiple experimental techniques for determining physical quantities.
- Develop skill in setting up apparatus for accurate measurement of physical quantities.
- Develop skill in identifying and rectifying the errors in a circuit connection.
- Apply and illustrate the concepts of electricity and magnetism experiments.

PC1541 Statistical and Quantum Mechanics

- Able to define phase space, microstate, macrostate and ensemble.
- Learn to distinguish different statistical distributions and judge which distribution applies to a given system.
- Identify the quantum mechanical concepts applicable to Physical systems.
- Apply the concepts of Quantum Mechanics to solve problems.
- Derive Equations of motion of Physical systems using quantum concepts.

PC1542 Electronics

- Understand the working of semiconductor diodes and analyze diode circuits for rectifiers and voltage regulators.
- Explain the working of bipolar junction transistors and analyze transistor biasing circuits.
- Design and analyze Single Stage Common Emitter amplifier.
- Understand feedback principles and construct sinusoidal oscillator circuits.
- Design and analyze basic operational amplifier circuits.
- Simplify Boolean expressions and construct binary adder, subtractor and flip flops using logic gates.

PC1571 Database Management Systems

- Understand the concept of database.
- Develop skills to design an ER diagram.
- Create database using SQL and perform operations in SQL.
- Familiarize the management of concurrent transactions.
- Apply the design concepts and normalization in database easily.

PC1581.A Open Course: Digital Marketing

- Remember Digital marketing function in organizations.
- Understand different modes of payments.
- Analyze security and legal issues in digital marketing.
- Understand social media marketing.

PC1581.B Open Course: Internet and WWW

- To understand the basic concepts of Networks.
- To learn the working of Internet.
- To analyse different search engines and its working.
- To familiarise Network Protocols and WWW.

PC1581.C Open Course: Impact of Social Media Networks

- To understand the types of social media networks and its uses.
- To learn the impact of social media on society & commerce.
- To analyse the impact of social media on work, training & development and on relationships.
- To familiarize challenges of social media in terms of privacy, security & health.

PC1641 Solid State Physics

- Understand the crystal structure of different materials and lattice dynamics.
- Understand the X ray diffraction.
- Extend their knowledge in theoretical fundamentals of electron theory.
- Explain the concept of phonons and lattice vibrations.
- Understand the properties of dielectric and ferroelectric materials.
- Describe the concept of superconductivity.

PC1642 Atomic, Molecular and Nuclear Physics

- Understand the fundamental aspects of atomic Physics.
- Understand the behavior of atoms in electric and magnetic fields.
- Examine the construct of many electron atoms spectra.
- Understand the rotational and vibrational spectra of molecular structure.
- Understand the general facts and fundamental properties of nucleus.
- Illustrate the various nuclear models such as Liquid drop model, Nuclear shell model.
- Describe the nuclear decays and nuclear reactions along with their occurrence probabilities.
- Explain the basic interaction mechanisms for charged particles and electromagnetic radiation and explain the working principles behind detectors and their characteristic properties with respect to energy resolution, efficiency etc.
- Acquire a thorough understanding of the fundamental interactions, elementary particles, the classifications of particles: leptons, hadrons (baryons and mesons), conservation laws and quarks models for elementary particles.

PC1661.1 Astronomy and Astrophysics

- Familiarize and appreciate the field of astronomy.
- Comprehend astronomical scales and basic concepts of positional astronomy and can understand about stellar parameters and spectral classification.
- Basic information about the formation of stars, their magnitudes and luminosity.
- To understand the structure of sun.
- Describe the classification of stars, stellar evolution, interstellar matter, galaxies etc.
- To understand the origin of the Planets.
- Explain Earth's motion in space; rotation and revolution, predict seasons using diagram of Earth and sun, Describe what causes seasons.

PC1661.2 General Meteorology

- Understand the basic concepts of meteorology.
- Understand the composition of vertical structure of the atmosphere.
- Interpret equations that describe atmospheric processes for various spatial and temporal scales.
- Understand the energy transfer phenomenon between earth and atmosphere.

- Apply fundamental physical principles in understanding atmospheric and climate processes.
- Understand the basic thermodynamic concepts for the atmosphere.
- Describe and quantify the role of greenhouse gases in earth's energy budget and climate system.
- Develop skills for interpreting and applying atmospheric observations.

PC1661.3 Space Science

- Acquire knowledge on the physical universe, its evolution, and the tabulation of the positioning of astronomical objects.
- Understand the evolution, classification, formation of stars, stellar phenomena, and theories of the interstellar medium.
- Understand various solar radiation and phenomena related to the sun.
- Understand different layers of atmosphere and analysis of their temperature, pressure, and density profiles.
- Understand the earth's magnetic field and various magnetic phenomena associated with it.

PC1661.4 Photonics

- Understand the basics of semiconductor physics.
- Illustrate the working of simple devices based on semiconductor physics.
- Extend the knowledge of working of semiconductor to its device applications.
- Understand and illustrate the working of various semiconductor diodes.
- Understand various electrooptic effects and its applications.
- Understanding the basics of non-linear optics.
- Understanding and analyzing advanced device applications of photonic devices.

PC1661.5 Nanoscience and Technology

- Explain the electrical, optical, magnetic, thermal, mechanical properties of nanomaterials.
- Have a good idea on the applications of nanomaterials and nanotechnology.
- Gather required knowledge on the synthesis of nanomaterials using bottom-up or top-down approach.
- Characterize nanomaterials using different analysis tools.
- Understand the Synthesis, properties, applications and importance of carbon nanostructures.
- Understand the different nanomachines and nanodevices.

PC1671 Computer Networks and Security

- Remember various network technologies, design issues and characteristics.
- Understand the purpose of computer networks and the basic issues in information security.
- Apply the use of layer architecture for networking systems, information security measures.

- Analyze the concept of different models of network and the working of various ciphers.
- Evaluate data link controls and Information Security policies.
- Create awareness on different networking protocols and information security policies.

PC1672 Operating Systems

- Understand working of various Operating Systems.
- Apply constrained resource allocation, process scheduling and memory management techniques.
- Evaluate synchronization of processes and protection of an Operating System.
- Analyse salient features available to various Operating Systems.

PC1643 Practical: Optics and Basic Electronics

- Understand how to use a spectrometer.
- Obtain a practical understanding of the refraction of light by a prism.
- Use basic laws to study the spectral and optical properties of the given prism and grating.
- Apply the knowledge to understand the working of PN junction diode and Zener diode.
- Apply basic laws and theories to construct basic circuits involving diodes and transistors.

PC1644 Digital Electronics, Computational Physics and Project Work (core)

- Understand the working of gates and verify their operation.
- Design and construct basic combinational circuits.
- Design and construct basic sequential circuits.
- Basic understanding of python programming.
- Apply python programming skills to solve computational physics problems.
- Be initiated into the basics of research.
- Imbibe sound moral and ethical values.

PROGRAMME 7: B.Sc. Statistics

PROGRAMME SPECIFIC OUTCOMES

PSO1: Demonstrate the ability to apply fundamental concepts of Descriptive Statistics.

PSO2: Apply the basic ideas of probability, random variables, mathematical expectation and probability distributions in real life studies and sustainability values.

PSO3: Reflect the skill of designing sample survey, finding sampling distributions of statistics to address ethical and social issues.

PSO4: Able to choose suitable sampling method to draw samples from the populations under study.

PSO5: Apply the foundations of classical inference involving point estimation, forming confidence interval and hypothesis testing.

PSO6: Demonstrate the skills of applied statistics such as correlation-regression, analysis of variance, design of experiments, demographics methods, statistical quality control and economic statistics.

PSO7: Apply the techniques of Operations Research and various analytical methods.

PSO8: Apply the classical methods of 'Real and Complex Analysis' in the development of mathematical and statistical models.

PSO9: Expertise in using statistical software – R programming, SPSS and Excel to meet the challenges of research and development.

COURSE OUTCOMES

ST1141 Statistical Methods I

- Describe origin and meaning of Statistics, its uses and relation with other disciplines and its limitations and misuses.
- Describe methods of collection of primary data and sources of secondary data.
- Design a questionnaire and a schedule.
- Classify and tabulate data.
- Diagrammatically represent data through line diagram, bar diagrams, pie diagrams, pictograms, cartograms and graphically represent frequency distribution by frequency polygon, frequency curve and ogives.
- Learn measures of central tendency and measures of dispersion, describe their properties.
- Learn positional averages – quartiles, deciles and percentiles.
- Learn moments - raw and central moments and their inter-relationships and describe Sheppard's corrections for moments for grouped data.
- Describe skewness and kurtosis and learn various measures of them.
- Use R built in functions to solve numerical problems associated with topics covered in various modules. (Practical)

ST1241 Statistical Methods – II

- Describe the concept of correlation and compute Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient.
- Discuss partial and multiple regressions for three variables.
- Describe the concepts of curve fitting.
- Fit the regression equations using the method of least squares.
- Describe data mining and data warehousing.
- Define data mining models and algorithms.
- Use R built in functions to solve numerical problems associated with topics covered in various modules. (Practical)

ST1341 Probability and Distributions – I

- Describe random experiment, sample space, events, types of events.
- Describe various definitions of probability, conditional Probability and multiplication theorem, and their applications in problem solving.
- Learn the concept of geometric probability.
- Describe univariate random variables in Discrete as well as in continuous cases, distribution function, probability mass function and probability density function, apply their properties in problem solving.

- Describe bivariate random variable, joint distribution function, joint probability mass function, marginal and conditional distributions, independence of random variables and apply their properties in problem solving.
- Describe functions of random variables both in univariate and bivariate cases, transformations of random variable and apply the concepts in problem solving.
- Describe mathematical expectation, expectation of function of random variables (up to bivariate case) and apply its properties in problem solving.
- Apply the concepts of correlation coefficient, conditional expectation (regression function), and conditional variance in problem solving.
- Learn various generating functions and their properties.
- Use R built in functions to solve numerical problems associated with topics covered in various modules. (Practical)

ST1441 Probability and Distributions – II

- Describe the univariate discrete distributions- Degenerate, Bernoulli, Binomial, Poisson, Geometric and Hyper geometric.
- Define multinomial distribution and its properties.
- Describe the univariate continuous distributions-Uniform, Triangular, Gamma, Beta 2 types, Exponential, Normal, Lognormal and Cauchy.
- Explain the concepts of multivariate normal distribution.
- Derive the marginal and conditional distribution of bivariate normal distribution.
- Use R built in functions to solve numerical problems associated with topics covered in various modules. (Practical)

ST1541 Limit Theorems and Sampling Distributions

- Understand the convergence of a sequence of events.
- Explain the laws of large numbers.
- Apply Chebychev's inequality and central limit theorem.
- Describe central and non-central sampling distributions.
- Make use of tables of χ^2 , t and F distributions.
- Explain the probability distributions of r^{th} order statistic.
- Explain probability distributions of 1^{st} and n^{th} order statistic from U (0, θ) and exponential distributions.
- Use R built in functions to solve numerical problems associated with topics covered in various modules. (Practical)

ST1542 Estimation

- Define the desirable properties of a good estimator.
- Explain whether an estimator satisfy any of the desirable properties or not.
- Construct confidence intervals for mean, variance, proportion in a population and difference between means and difference between proportions in two populations.
- Explain Gauss Markov set up.
- Illustrate the estimability of a linear parametric function.

- Use R built in functions to solve numerical problems associated with topics covered in various modules. (Practical)

ST1543 Testing of Hypothesis

- Describe the fundamental concepts of testing of hypothesis.
- State Neyman-Pearson lemma.
- Apply Neyman Pearson's lemma for mean and variance of a normal population, the Mean of binomial and Poisson distribution.
- Define most powerful test and UMP test.
- Explain likelihood ratio test and its properties.
- Apply large sample tests and small sample tests.
- Describe non-parametric test.
- Use R built in functions to solve numerical problems associated with topics covered in various modules. (Practical)

ST1544 Sample Survey Methods

- Explain the basic concept of sample survey.
- Distinguish between sample survey and census survey.
- Apply various sampling schemes like SRS, Stratified sampling and Systematic sampling.
- Compare the efficiencies of estimates obtained using different sampling techniques.
- Describe the merits and demerits of different sampling techniques.
- Obtain the estimates for population mean using Ratio and Regression estimators, and compare their efficiencies.
- Use R built in functions to solve numerical problems associated with topics covered in various modules. (Practical)

ST1551.1 Open Course: Statistics and Research Methodology

- Explain the concepts & objectives of research and formulation of research process.
- Describe the role of statistics in research.
- Organize and present the data collected.
- Design a questionnaire & conduct sample survey.
- Explain basic concepts of testing of hypothesis.
- Explain the methods of writing research reports.

ST1551.2 Open Course: Stochastic Processes

- Describe and exemplify concepts of stochastic processes, time space and state space, classification of stochastic processes based on the nature of time space and state space.
- Explain Markov chains: Definition, transition probability matrix, n-step transition Probability and Chapman-Kolmogorov equation
- Calculate n-step transition probabilities
- Classify states of a finite Markov chain.
- Distinguish between strict and weak (covariance or wide sense) stationarity,

- Describe Branching processes, offspring distribution, extinction probabilities.

ST1551.3 Open Course: Design of Experiments

- Explain the concept of design of experiments.
- Identify estimability of a linear parametric function.
- Apply Gauss-Markov theorem for finding BLUE of a parametric function.
- Explain the principles of experimentation.
- Perform one-way and two-way analysis of variances.
- Design and analyse CRD, RBD, LSD.
- Perform missing plot analysis in RBD and LSD.

ST1551.4 Open Course: Official Statistics

- Explain the present official statistical system in India.
- Describe the functions and activities of central and State statistical organisations.
- Describe index numbers and its application and apply the various methods of constructing index numbers.
- **Construct Consumer price index.**
- Explain time series analysis and develop time series models.

ST1551.5 Open Course: Time Series and Forecasting

- Understand the concepts of time series.
- Evaluate the components of time series.
- Understand and apply forecasting techniques.
- Explain different models of time series.
- Apply computation techniques and its interpretations.

ST1551.6 Open Course: Statistics for Psychology and Education

- State main ideas about the concepts of basic Statistics.
- Prepare a questionnaire and conduct a sample survey.
- Describe of various Statistical tools.
- Express some ideas about the applications of Statistics in different areas of psychological studies.
- Calculate the various measures of correlation coefficient.

ST1551.7 Open Course: Econometric Methods

- Describe simple and multiple linear regression models and its assumptions.
- Apply principle of least square method to estimate the parameters in simple and multiple linear regression models.
- Identify multi collinearity problem and its consequences.
- Describe generalized least square method of estimation.
- Understand the test for autocorrelation.
- Understand the role of dummy variable and lagged variable.

ST1551.8 Open Course: Essential Statistics for Social Sciences

- Describe the importance of Statistics in social research
- Define the main steps in conducting a sample survey
- Prepare diagrams and graphs to represent frequency tables
- Compute the different measures of central tendency and variability of a given data
- Explain the relation between two variables using correlation and regression
- Express the concept of probability and define some basic probability distributions
- Discuss the basic concepts regarding testing of hypothesis
- Explain the uses of various non-parametric tests

ST1551.9 Open Course: Statistics for Humanities

- Explain the history and scope of statistics & describe the steps involving a statistical survey.
- Prepare a questionnaire.
- Collect primary & secondary data.
- Construct the diagrams and graphs for a given dataset (s).
- Compute & compare measures of central tendency & dispersion.
- Compare correlation & association.
- Compute and interpret test of association of attributes.

ST1551.10 Open Course: Geostatistics

- Explain the elementary principles of Statistics such as measures of central tendency, absolute and relative measures of dispersion.
- Identify statistical methods generally used in Earth Sciences.
- Use statistical tools for analysis of data from different areas of geosciences.
- Carry out test of hypothesis.

ST1551.11 Open Course: Data Analysis

- Calculate the various measures of central tendency and dispersion, correlation coefficient.
- Distinguish between partial and multiple correlation.
- Realize the difference between simple and multiple regression.
- Use R for statistical data analysis.
- Analyze data using R and understand the insights from it.
- Familiarize the uses of various parametric and non-parametric tests.

ST1641 Design of Experiments and Vital Statistics

- Carry out one-way and two-way analysis of variances.
- Explain the basic concepts and principles of experimental design.
- Carry out the analysis of CRD, RBD and LSD.
- Carry out analysis in RBD and LSD with one or two missing observations.
- Carry out the analysis of 22 and 23 factorial experiments.
- Compute various measures of fertility, mortality and population growth.

- Construct life tables.
- Use R built in functions to solve numerical problems associated with topics covered in various modules. (Practical)

ST1642 Applied Statistics

- Identify the various index numbers and compute them for data sets.
- Explain the concepts of base shifting, splicing and deflation of index numbers, consumer price index number.
- Explain the component of time series and estimate trend and seasonal effect.
- Explain the roles and responsibilities of various organizations.
- Explain the methods of data collection and dissemination in population census.
- Explain the methods of estimation of National Income.
- Use R built in functions to solve numerical problems associated with topics covered in various modules. (Practical)

ST1643 Operations Research and Statistical Quality Control

- Explain the evolution and significance of OR.
- Describe the concept of OR.
- Solve LPP using graphical method and simplex method.
- Solve LPP using Big M method and Two-phase method.
- Explain the concept of SQC and mention its application.
- Construct control chart for variables and attributes.
- Describe acceptance sampling plans.
- Use R built in functions to solve numerical problems associated with topics covered in various modules. (Practical)

ST1661.1 Biostatistics

- Explain the basic idea of clinical trial experiments
- Articulate the ethics, principles and conduct of clinical trial experiments with an overall view of Phase I-IV trials.
- Describe different studies in clinical trials.
- Demonstrate basic understanding of epidemiologic methods and study design.
- Design and analysis of epidemiological studies including case-control and cohort study designs.

ST1661.2 Econometric Methods

- Explain the concept of Econometrics.
- Explain simple linear regression model.
- Apply the concept of ordinary least squares and estimate the parameters involved in a simple linear model.
- Define a general linear model.
- Recognize and discuss the problems of multicollinearity, autocorrelation and heteroscedasticity in linear regression models.

- Define the concept of generalized least squares.

ST1661.3 Inventory Control and Queuing Theory

- Describe inventory control and cost associated with inventories.
- Explain Economic order quantity (EOQ).
- Solve Deterministic Inventory problem with and without shortages.
- Describe EOQ Problems with price breaks.
- Discuss probabilistic inventory Control.
- Explain Newspaper boy problem.
- Discuss the basic concepts of queuing theory.
- Derive the steady state solution of M/M/1 queue model.
- Illustrate cost models in queuing.

ST1661.4 Reliability and Survival Analysis

- Understand the concepts of reliability analysis.
- Explain hazard function and reliability function.
- Evaluate the reliability of systems.
- Understand and evaluate the notion of ageing.
- Explain different lifetime distributions.
- Apply different censoring schemes.
- Explain different parametric estimators.
- Apply different regression models.

ST1661.5 Machine Learning

- Download and Install Python
- Understand basic commands of Python
- Describe the functions of Python
- Describe the machine learning application
- Describe the concept of Bayesian decision theory
- Describe various clustering methods

**Institution offers two Post-Graduate Courses namely M.Sc. Mathematics and M.Sc. Physics. But the syllabus of both programmes are not currently outcome based, hence not included in this.