Department of English

GOVERNMENT DEGREE COLLEGE TRAL

COURSE/LEARNING OUTCOMES

Semester 1ST

The course "English Literature – I" for the first semester of the Bachelors Programme in English Literature aims to foster foundational literary skills, critical thinking, and an understanding of major genres and forms in English poetry and drama

Course Outcomes

- Develop a nuanced appreciation of poetic forms such as lyric, sonnet, elegy, epic, ode, and ballad, alongside mastery of elements like metre, rhyme, structure, stanza types, and poetic devices including metaphor, simile, imagery, allusion, symbol, irony, alliteration, assonance, and personification.
- Gain competence in analysing selected canonical works, notably Shakespeare's Sonnets (18, 66, 116) and Milton's "Lycidas", integrating themes, stylistics, and historical relevance.
- Understand the evolution of English drama, including a broad spectrum of dramatic types such as tragedy, comedy, tragicomedy, farce, melodrama, and heroic drama, as well as key dramatic elements like plot, character, setting, dialogue, conflict, theme, and spectacle.
- Apply theoretical frameworks to the study of Shakespearean drama, specifically "Othello", through the analysis of dramatic structure, characterization, and thematic depth.
- Engage in scholarly assignments and tutorials that reinforce close reading, textual analysis, and academic writing related to poetry and drama selections.

Learning Outcomes

- Demonstrate the ability to identify and differentiate between major forms and elements of poetry and drama.
- Perform literary analysis on prescribed texts, showing proficiency in interpreting language, imagery, structural features, and underlying themes.
- Contextualize major literary works within the broader scope of historical development and cultural impact of English literature.

- Articulate informed responses to core texts using appropriate literary terminology and critical methodologies.
- Produce well-structured academic assignments that reflect methodological rigor and engagement with course materials.

Semester 2ND

The English Literature II course in the second semester of the Bachelor's Programme is designed to deepen students' abilities in analysing English poetry, drama, and the novel with advanced literary concepts and historical context.

Course Outcomes

- Acquire advanced knowledge of significant English poems by Donne and Pope, with emphasis on assessing their structure, thematic concerns, and stylistic achievements through close readings of texts such as "A Valediction: Forbidding Mourning," "Batter My Heart," and sections of "An Essay on Man".
- Develop critical understanding of early English drama through an in-depth study of Shakespeare's "Twelfth Night," focusing on dramatic technique, character development, and thematic exploration within the play.
- Gain foundational insight into the rise of the English novel, learning to identify and apply core elements of fictional narrative including plot, character, setting, narrative techniques, and distinguishing among major novel types—novella, historical novel, Bildungsroman, realistic novel, and psychological novel.
- Attain specialized competence in literary analysis of classic English fiction via Jane Austen's "Pride and Prejudice," integrating theory with practical textual analysis.
- Apply academic writing and analytical skills to assignments based on drama and the novel, synthesizing interpretations, comparisons, and critical arguments across genres.

Learning Outcomes

- Demonstrate proficiency in literary criticism through detailed analysis of prescribed poetry, drama, and fiction, articulating responses with appropriate terminology and context.
- Recognize and interpret the historical and stylistic evolution of English poetry, drama, and the novel, situating major works within broader literary movements and cultural shifts.
- Identify and distinguish structural and thematic features across poetic, dramatic, and fictional texts, showing skill in comparative analysis and interpretation.
- Consistently produce methodical and well-argued assignments that reflect advanced engagement with diverse genres of English literature.

Semester 3RD

The third semester course “British Poetry and Drama: 17th–19th Century” is designed to immerse students in landmark genres, styles, and historical contexts in English literature, allowing advanced appreciation and analysis of both poetry and dramatic works.

Course Outcomes

- Attain substantial knowledge of the socio-political background and its influence on literary production from the Elizabethan, Restoration, and Romantic periods, enabling nuanced contextualization of assigned texts.
- Develop advanced understanding of the evolution and distinguishing traits of English dramatic and poetic forms from the 17th to the 19th century by studying representative works such as Marlowe’s "Tamburlaine the Great," Wilde’s "The Importance of Being Earnest," Johnson’s "The Vanity of Human Wishes," Gray’s "Elegy Written in a Country Churchyard," Blake’s "London" and "The Lamb," and Wordsworth’s *"Tintern Abbey*" and *"Resolution and Independence"*.
- Cultivate the ability to identify and analyze thematic, structural, and stylistic features characteristic of the Elizabethan, Restoration, and Romantic eras, focusing on both narrative and performance strategies.
- Integrate experiential learning by engaging with local theatre performances, facilitating a direct understanding of dramatic staging, adaptation, and audience engagement.
- Critically examine how socio-political concerns and historical events shaped literary movements and the development of poetic and dramatic genres within the English canon.

Learning Outcomes

- Demonstrate informed analysis of major British literary works, displaying competence in evaluating both the formal and contextual dimensions of poetry and drama from the 17th to 19th centuries.
- Effectively articulate the historical and cultural transitions that impacted literary production, interpretation, and innovation during the selected periods.

- Apply advanced literary criticism in recognizing the salient stylistic and narrative strategies employed by authors, distinguishing the specific features of Elizabethan, Restoration, and Romantic writing.
- Present methodologically robust academic assignments and critique, synthesizing textual evidence and theoretical frameworks in written and oral forms.
- Exhibit a sophisticated appreciation for the interplay of literary genre, form, and social context, preparing for further specialized inquiry within literary studies.

Semester 4th

Course Outcomes

- Students will attain a nuanced comprehension of the 19th-century English novel within its socio-historical context, developing an informed perspective on nineteenth-century British society and its literary output.
- Learners will demonstrate familiarity with major canonical novelists, notably Charlotte Brontë and Charles Dickens, and critically engage with thematic and stylistic elements present in their works.
- Students will develop the ability to identify, analyse, and evaluate the distinguishing features of Victorian novels and principal poetic forms, including the lyric and dramatic monologue, as represented in the works of Alfred Tennyson and Robert Browning.
- Graduates of this course will be equipped to trace and interpret the ongoing intellectual debate between science and religion that characterises Victorian literature.

Learning Outcomes

- Articulate the interconnectedness of historical and literary developments in nineteenth-century Britain, with specific reference to selected novels and poetry.
- Critically examine the evolving forms and conventions of Victorian poetry, with detailed textual and contextual analysis.
- Demonstrate understanding of Victorian literary temperaments and their representations through comparative analysis of assigned texts.

ELR422J2: American Literature, 19th and 20th Century

Course Outcomes

- Students will achieve advanced understanding of the distinctive tradition of American literature, particularly as it intersects with the socio-political history of the United States.
- Learners will cultivate familiarity with major American writers of the nineteenth and twentieth centuries and gain proficiency in identifying stylistic and thematic features inherent in their seminal works.

- The course will enable students to analyze the relationship between historical change and artistic expression through close study of select texts covering diverse genres, including poetry, drama, and the novel.
- Upon completion, students will be capable of critical appreciation and sophisticated analysis of selected literary texts, with attention to distinguishing features and socio-political underpinnings.

Learning Outcomes

- Demonstrate nuanced comprehension of American literary writing and its reflection of historical and socio-political contexts.
- Identify and explicate the defining characteristics of selected works across the genres of poetry, drama, and the novel through textual analysis.
- Exhibit familiarity with major figures in American literature and their contributions to shaping literary and cultural paradigms.

ELR422J3: Literature of the Indian Diaspora

Course Outcomes

- Students will develop a comprehensive understanding of the concept of diaspora, tracing its origins, development, and intersection with literary representation.
- Learners will analyze and interpret the influence of various forms of migration from South Asia, exploring how these movements inform literary constructs of home, identity, and belonging.
- The course emphasizes critical examination of key authors and works from the Indian Diaspora, facilitating appreciation of their unique historical, cultural, political, and socio-economic contexts.
- Students will explore postcolonial diaspora literature with attention to geography, form, and gender, focusing on contrasting styles and sensibilities in male and women diasporic authors.
- **Learning Outcomes**

- Articulate the nature and development of Diaspora and assess its significance for literary creation and representation.

- Discern and critically engage with concepts such as exile, nostalgia, displacement, and home within the framework of South Asian diasporic literature.
- Analyze and discuss gender-specific concerns in the writings of women from the Indian Diaspora, demonstrating an awareness of thematic and stylistic diversity.

Semester 5th

ELR522J1: English Literature - Short Story Across Cultures

Course Outcomes

- Students will develop a comprehensive understanding of the historical evolution and global diversity of the short story as a literary genre.
- Learners will be able to critically engage with and interpret various traditions and thematic preoccupations within the short story, appreciating cultural nuances across selected texts.
- Students will acquire analytical skills to identify and evaluate narrative techniques and stylistic devices employed by distinguished short story writers.
- Graduates will be proficient in comparative literary analysis across cross-cultural short story traditions, enhancing their critical appreciation and contextual understanding.

Learning Outcomes

- Articulate the development and defining characteristics of the short story as a literary form.
- Analyze and critique key elements including plot, character, theme, and narrative strategy within diverse short story texts.
- Demonstrate awareness of cultural influences on short story writing through critical examination of texts by O. Henry, Edgar Allan Poe, Guy de Maupassant, and Leo Tolstoy.

ELR522J2: Indian Writing in English

Course Outcomes

- Students will gain an in-depth understanding of the evolution and nativization of English within the Indian socio-cultural and postcolonial context.
- Learners will critically evaluate the contributions of prominent Indian English writers, focusing on their narrative techniques, thematic concerns, and stylistic innovations.
- The course will equip students to analyze the intersection of cultural identity, gender, linguistic diversity, and sociopolitical issues as reflected in Indian writing in English.

- Graduates will develop advanced interpretive skills for synthesising informed critiques of major literary texts, with attention to gender, tradition, modernity, and societal change.

Learning Outcomes

- Explain the historical development of English literature in India and contextualise it within colonial and postcolonial frameworks.ELR522J2Sem5th-copy.pdf
- Critically assess literary styles and thematic motifs in selected works by Mulk Raj Anand, Anita Desai, Nissim Ezekiel, and Girish Karnad.
- Demonstrate nuanced understanding of gender perspectives and cultural complexities in Indian diasporic and indigenous writings.

ELR522J3: Afro-American Literature

Course Outcomes

- Students will understand the historical and socio-political contexts that have shaped Afro-American literary expression.ELR522J3Sem5th-copy.pdf
- Learners will trace the evolution of Afro-American literature across genres including autobiography, novel, poetry, and drama, with a focus on thematic and formal features.
- The course will enable critical appreciation of the interrelationship between cultural identity and literary production among Afro-American writers.
- Graduates will be adept at analyzing and evaluating major Afro-American authors and their contributions to American literature and cultural history.

Learning Outcomes

- Demonstrate knowledge of Afro-American history and its influence on literary themes and forms.
- Critically analyze thematic and structural features in selected texts by W.E.B. Du Bois, Toni Morrison, Langston Hughes, Audre Lorde, and August Wilson.
- Evaluate the role of literary expression in articulating Afro-American cultural identity and sociopolitical struggles.

Semester 6th

ELR622J1: British Literature, 20th Century

Course Outcomes

- Students will critically examine the historical and cultural contexts influencing British literature at the turn of the 20th century, identifying key socio-political and intellectual movements shaping literary production.ELR622J1Sem6th-copy.pdf
- Learners will evaluate the intersections between literature and societal change by analyzing stylistic and narrative strategies in modernist texts by T.S. Eliot, W.B. Yeats, G.B. Shaw, and Virginia Woolf.
- The course prepares students to perform close textual readings with enhanced interpretive skills, exploring themes, imagery, and poetic techniques characteristic of modernism.ELR622J1Sem6th-copy.pdf
- Graduates will demonstrate the ability to articulate complex literary insights in coherent critical discussions and written analyses.

Learning Outcomes

- Identify and discuss defining features of modernism including formal experimentation and engagement with social and philosophical issues.
- Analyze major themes and literary devices employed in key modernist texts, supporting interpretations with textual evidence.
- Participate effectively in scholarly discourse concerning modernist literature, articulating perspectives in both oral and written forms

ELR622J2: Postcolonial Literatures in English (African and Caribbean)

Course Outcomes

- Students will develop a broad understanding of African and Caribbean literatures in English, situating them within their distinct historical and socio-political contexts.
- Learners will critically engage with themes of identity, power, belonging, and representation as they manifest across diverse postcolonial texts.

- The course fosters critical thinking on narrative and stylistic strategies used by writers such as Ngugi wa Thiong'o, Chinua Achebe, George Lamming, Derek Walcott, and Edward Brathwaite.
- Graduates will be capable of constructing reasoned interpretations linking literary works to their cultural and political milieus.

Learning Outcomes

- Categorize and differentiate literary styles and thematic concerns characteristic of African and Caribbean postcolonial literatures.ELR622J2Sem6th-copy.pdf
- Analyze how postcolonial writers use language and narrative to address cultural displacement and assertion of identity.
- Formulate critical, well-supported written and oral analyses that contextualize postcolonial texts within broader socio-political frameworks

ELR622J3: Kashmiri Literature in Translation

Course Outcomes

- Students will acquire comprehensive knowledge of the historical, cultural, and socio-political influences on Kashmiri literature, recognizing its significance to regional identity.
- Learners will critically evaluate translated poetic and prose works, analyzing diverse themes and literary styles found in the writings of Lala Ded, Habba Khatoon, Shaikh-ul-Alam, Mahmud Gami, and Kashmiri short story authors.
- The course encourages appreciation of translation as a complex process that bridges linguistic and cultural divides, enhancing literary accessibility.
- Graduates will develop critical skills to assess the challenges and strategies of translating Kashmiri literature while engaging with its aesthetic and cultural dimensions.

Learning Outcomes

- Demonstrate understanding of the socio-cultural context underpinning Kashmiri literature and its evolution through translations.
- Critically analyze key themes, symbolism, and poetic techniques in selected translated texts.

- Assess the role of translation in preserving and transmitting Kashmiri literary heritage and cultural identity

SD/

Dr. Shabir Hussain Mirza

Head Department of English

GDC Tral

PROGRAMME OFFERED: B. SC.

Programme Outcome (PO)

PO1. A student completing the **B.Sc.** degree with **Botany** as a major/minor subject is able to understand the different branches of Botany such as systematics, evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics and molecular biology of various life-forms.

PO2. They become competent enough in various analytical and technical skills related to plant sciences.

PO3. The student is capable to perform short research projects using various tools and techniques in plant sciences and develop scientific temperament and research attitude.

B.Sc. Semester-1
Biodiversity (Microbes, Algae, Fungi, and Archegoniate)

Learning Outcome (LO)

LO: To impart understanding to students about economic importance and diversity of viruses, bacteria, fungi, algae, bryophytes, pteridophytes and gymnosperms, and to acquaint them about the classification, structure, morphology and reproduction of viruses, bacteria, fungi, algae, bryophytes, pteridophytes and gymnosperms.

Course Outcome (CO)

CO1: Know the evolutionary link between various plant groups.

CO2: Understand the positive and negative role of microbes, their pivotal role in important processes of fermentation, biological nitrogen fixation and scavenging.

CO3: Recognise the role of blue green algae in nitrogen fixation and thereby tapping their potential as bio- fertilizers.

CO4: Have a deep insight about the role of Algae in the sustenance of the marine life and global carbon and phosphorus cycles.

CO5: Understand the role of lichens as pioneers of succession, thereby reclaiming vast barren lands into fertile lush green landscapes.

CO6: Acknowledge the role of gymnosperms as a “Green Gold”, thus alleviating the economy of the places by furnishing timber, resins, firewood and chilgoza.

B. Sc. Semester-2
Anatomy of Angiosperms

Learning Outcome (LO)

LO: To aware students about fundamental concepts of plant anatomy, to make them understand the structure of different organs of plants, secondary growth and structure of wood in plants.

Course Outcome (CO)

CO1: Grasp the various tissue systems of plants.

CO2: Perceive various "meristems", their role in building the lofty angiosperm and gymnosperm trees.

CO3: Have a better comprehension of defence mechanism of plants in the form of spines, thorns, stinging hairs and the formation of cork.

CO4: Distinguish the structure, texture and durability of various forms of woods.

B. Sc. Semester- 3
Morphology of Angiosperms

Learning Outcome (LO)

LO: To impart knowledge to the students about morphology of angiosperms, and to acquaint them about the importance of morphology in understanding Botany.

Course Outcome (CO):

CO1: Have a better comprehension about morphology of angiosperms

CO2: Understand the essentials of pollination, fruit set, seed and fruit dispersal mechanism; the flower as the basic unit of the above phenomena.

B. Sc. Semester- 4
J1- Plant Taxonomy

Learning Outcome (LO)

LO: To give students understanding about the concept, components and scope of plant taxonomy, classification and identification of plants, importance of herbaria and botanical gardens, and to learn about principles and rules of nomenclature.

Course Outcome (CO):

CO1: Students are able to learn the basics of plant systematics, the various taxonomic hierarchical categories and ranks; discern the local flora.

CO2: Familiarize themselves with the "floristic" and "botanical regions" of India.

CO3: Make "herbariums", "monographs" and "taxonomic keys"**.**

B. Sc. Semester- 4
J2- Plant Physiology

Learning Outcome (LO)

LO: To give students understanding about the concept and mechanism of various physiological processes viz., water and nutrient uptake, transport, photosynthesis, respiration and plant hormones.

Course Outcome (CO):

CO1: Assimilate the concept of plant physiology, mineral nutrition and transport of nutrients and water in plants.

CO2: See the basic biological reactions which are responsible for continuity of life viz., carbon dioxide fixation and respiration; role of enzymes as catalysts in driving these reactions.

CO3: Have a clear vision of phenomenon of "photoperiodism" and "vernalization" and their indispensable role in flowering of plants.

CO4: Sense the role of plant hormones in normal growth, fruit ripening and stress biology.

B. Sc. Semester- 4
J3- Plant Biochemistry

Learning Outcome (LO)

LO: To give students understanding about the structure, properties, functions and synthesis of important biomolecules involved in various biochemical pathways, enzymes and their biological roles.

Course Outcome (CO):

CO1: The student will enrich themselves about classification, occurrence, structure and biological significance of monosaccharides, oligosaccharides and polysaccharides (including sucrose, starch, cellulose and pectin) with the phenomenon of metabolism of primary and secondary metabolites and their role in plants.

CO2: They are upgraded about structure and function of proteins, nucleotides, enzymes, synthesis of biomolecules, carbohydrates, fatty acids and glycerol.

B. Sc. Semester- 5
J1-Mycology and Plant Pathology

Learning Outcome (LO)

LO1: The students will be able to learn about characteristics and identification of diverse groups of the fungi and their economic importance.

LO2: They will learn about the microbial pathogens and understand about etiology, epidemiology and management of selected plant diseases caused by microbial pathogens and will be able to demonstrate scientific skills in laboratory in the field of Plant Pathology.

Course Outcome (CO):

CO1: To aware students about diversity, structural, functional and economic aspects of fungi and to demonstrate a working knowledge of how fungi grow and reproduce, and where and how they can be isolated and to acquaint them about the significance of plant pathology and the plant diseases caused by plant pathogens.

B. Sc. Semester- 5
J2-Cell Biology

Learning Outcome (LO)

LO1: This course will be able to demonstrate foundational knowledge in understanding of the relationship between the properties of macromolecules, their cellular activities and biological responses.

LO2: Understanding of cell metabolism, chemical composition, physiochemical and functional organization of organelle and contemporary approaches in modern cell and molecular biology.

Course Outcome (CO)

CO1: Cell biology study will help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged.

CO2: This will provide insight into the organization of cell, its features and regulation at different levels.

CO3: Through the study of cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life.

B. Sc. Semester- 5
J3- Plant Molecular Biology

Learning Outcome (LO)

LO1: Successful completion of the Molecular Biology course will allow students to understand the chemical and molecular processes of life based on the genetic constituents of the cell.

LO2: They will learn to Comprehend the properties of the heritable material along with all the enzymes involved for proper replication fidelity.

LO3: They will employ scientific methods and design the experiments along with interpreting biological data to communicate concepts of molecular biology to wider scientific community as well as general public.

Course Outcome (CO):

CO1: This course is to expose the students and make them understand the basic concepts in molecular biology, basic composition of nucleic acids, their structure and their mode of replication, conversion of genetic information coded in DNA to cellular macromolecules to the DNA structure, transcription in both

prokaryotes and eukaryotes.

CO2: It also familiarizes students with DNA damage and repair mechanisms, different types of recombination models, transcription, RNA processing and translation and regulation of gene expression.

Skill Enhancement Courses (SEC)

Commercial Mushroom Cultivation–I & II

Learning Outcome (LO)

LO: To develop understanding about the scope of growing economically and industrially important mushrooms for marketing and processing.

Course Outcome (CO)

CO: The course will increase the understanding of students about the classification, structure, role and infectious cycle of various types of mushrooms.

Department of Mathematics
Government Degree College
TRAL-192123 (Kashmir)
ترال کالج ڈگری گورنمنٹ

Subject: Mathematics. Course: B.Sc

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

Programme Outcomes (POs)

PO1: Develop a strong foundation in mathematical concepts, theories, and problem-solving techniques applicable across scientific and engineering disciplines.

PO2: Acquire the ability to think critically, logically, and analytically to model and solve real-life problems using mathematical tools.

PO3: Gain proficiency in quantitative reasoning, data interpretation, and mathematical communication.

PO4: Develop research aptitude and the ability to apply mathematics in interdisciplinary contexts.

PO5: Cultivate ethical and professional responsibility, teamwork, and life-long learning skills through mathematical education and projects.

Programme Specific Outcomes (PSOs)

PSO1: Apply mathematical principles to model and solve problems in calculus, algebra, analysis, and applied mathematics.

PSO2: Demonstrate understanding of abstract structures and logical arguments in pure mathematics.

PSO3: Utilize computational and numerical techniques to analyze complex mathematical problems.

PSO4: Apply mathematical knowledge in teaching, research, and professional fields such as data science, operations research, and statistics.

Semester I

Course Title: ***Calculus – I***

Learning Outcomes (LOs):
Upon successful completion of this course, students will be able to:

LO1: Develop a conceptual understanding of *limits, continuity,* and *differentiability* in single-variable calculus.

LO2: Acquire the ability to apply *differential calculus techniques* to solve theoretical and applied problems.

LO3: Interpret the *geometrical significance of derivatives* in analyzing curves and physical systems.

LO4: Strengthen the foundation required for *advanced studies in mathematics* and applied sciences.

Course Outcomes (COs):
At the end of this course, the student will be able to:

CO1: Understand and apply the fundamental concepts of *limits, continuity,* and *differentiability* for real-valued functions.

CO2: Compute and interpret *first and higher-order derivatives* using standard theorems and rules.

CO3: Determine and analyze *tangents, normals, and curvature* for curves in Cartesian and polar coordinates.

CO4: Apply the theory of *maxima and minima* to solve optimization problems.

CO5: Use *Rolle's theorem, Mean Value theorems, Taylor's and Maclaurin's series* for functional approximation and analysis.

CO6: Perform *curve tracing* for Cartesian and parametric equations and compute associated geometric quantities.

Semester II

Course Title: ***Calculus – II***

Learning Outcomes (LOs):
Upon successful completion of this course, students will be able to:

LO1: Understand the concepts and applications of *integral calculus* in mathematics and applied sciences.

LO2: Learn and apply *integration techniques* to compute areas, volumes, and other physical quantities.

LO3: Develop the ability to solve *ordinary differential equations* using analytical and integral methods.

LO4: Explore the properties and applications of *special functions* such as Beta and Gamma functions.

Course Outcomes (COs):
At the end of this course, the student will be able to:

CO1: Apply *integration by partial fractions, reduction formulae,* and other standard techniques to evaluate integrals.

CO2: Utilize properties of *definite integrals* and the *fundamental theorem of calculus* to determine areas and related measures.

CO3: Compute *arc lengths, surface areas,* and *volumes of revolution* using integral methods.

CO4: Solve *first- and higher-order differential equations* using integrating factors and constant coefficient methods.

CO5: Understand and use *Beta and Gamma functions* and their interrelations for mathematical applications.

CO6: Employ *integral and differential calculus* to model and analyze *real-world problems* in science and engineering.

Semester III

Course Title: ***Theory of Matrices***

Learning Outcomes (LOs):

Upon successful completion of this course, students will be able to:

LO1: Understand the fundamental concepts, properties, and classifications of matrices.

LO2: Develop the ability to compute matrix algebra and apply matrix identities, determinants, and inverses.

LO3: Analyze eigenvalues, eigenvectors, and matrix polynomials for mathematical and applied problems.

LO4: Apply matrix theory to solve systems of linear equations and understand conditions of consistency.

LO5: Recognize and work with orthogonal, unitary, Hermitian, and skew-Hermitian matrices in various applications.

Course Outcomes (COs):

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

CO1: Classify matrices into Hermitian, skew-Hermitian, orthogonal, unitary, and other types and apply their structural properties.

CO2: Compute the adjoint, inverse, rank, and other transformations of matrices using elementary operations.

CO3: Use matrix polynomials, characteristic equations, and the Cayley–Hamilton theorem to solve matrix equations and compute matrix inverses.

CO4: Determine eigenvalues, eigenvectors, minimal polynomials, and analyze their role in stability, diagonalization, and decomposition.

CO5: Reduce matrices to normal forms and determine linear dependence/independence of rows and columns.

CO6: Solve systems of homogeneous and non-homogeneous linear equations and analyze their consistency using rank conditions.

CO7: Apply matrix techniques in real-life applications, including coding theory, cryptography, and system stability analysis.

Semester IV

Course Title: ***Real Analysis – I***

Learning Outcomes (LOs):

Upon successful completion of this course, students will be able to:

LO1: Understand the foundational properties of the real number system, including order, completeness, bounds, and density.

LO2: Analyze and classify sequences in terms of boundedness, convergence, divergence, and subsequential behavior.

LO3: Develop a foundational understanding of infinite series and apply various convergence tests.

LO4: Explore the topological structure of the real line through open sets, closed sets, limit points, neighborhoods, and cardinality.

Course Outcomes (COs):

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

CO1: Explain the structure of real numbers, including supremum, infimum, completeness, and density properties.

CO2: Determine the convergence or divergence of sequences using limit definitions, Cauchy criteria, Bolzano–Weierstrass theorem, and monotonicity.

CO3: Analyze infinite series and apply standard tests such as comparison, root, ratio, and Raabe's test to determine convergence.

CO4: Use properties of open and closed sets, limit points, closures, and neighborhoods to study subsets of the real line.

CO5: Demonstrate understanding of countable and uncountable sets, and prove fundamental results related to cardinality.

CO6: Apply the concepts of sequences, series, and set topology to real analysis problems encountered in higher mathematics.

Semester IV

Course Title: ***Geometry***

Learning Outcomes (LOs):

Upon successful completion of this course, students will be able to:

LO1: Understand and analyze standard conic sections (parabola, ellipse, hyperbola) and their important geometric properties.

LO2: Develop the ability to work with 3-dimensional objects such as spheres, cones, cylinders, and quadric surfaces.

LO3: Interpret and apply geometric concepts involving tangents, normals, poles, polars, and various coordinate systems.

LO4: Trace and visualize standard curves and surfaces in both Cartesian and polar coordinates.

LO5: Strengthen the understanding of plane geometry including equations, distances, and angles between geometric entities.

Course Outcomes (COs):

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

CO1: Analyze parabola, ellipse, and hyperbola using standard, parametric, and polar forms, and compute their tangents, normals, poles, and polars.

CO2: Determine conditions under which a general second-degree equation represents a conic and identify the corresponding conic.

CO3: Understand and compute properties of 3D objects including spheres, coaxial systems, cones, cylinders, and conicoids.

CO4: Determine equations of tangent planes, normals, director sphere, polar planes, and envelopes of conicoids and cylinders.

CO5: Formulate and solve problems related to planes such as intercept form, normal form, distance from a point, angle between planes, and intersection of planes.

CO6: Analyze quadric surfaces including paraboloids, ellipsoids, and hyperboloids, and trace standard curves in 2D and 3D geometry.

CO7: Apply geometric concepts to graphing and visualization of curves and surfaces, and solve related analytical problems.

Semester IV

Course Title: ***Theory of Numbers***

Learning Outcomes (LOs):

Upon successful completion of this course, students will be able to:

LO1: Understand the fundamental properties of integers, divisibility, prime numbers, and classical number theoretic results.

LO2: Develop the ability to solve Diophantine equations, linear congruences, and apply modular arithmetic.

LO3: Gain knowledge of number theoretic functions, Euler's function, Fermat's and Euler's theorems, and the Chinese Remainder Theorem.

LO4: Analyze the structure of integers modulo nnn, including primitive roots, quadratic residues, and the Legendre symbol.

LO5: Understand the theory of polynomial equations, including roots, coefficients, and classical solution techniques.

Course Outcomes (COs):

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

CO1: Apply divisibility rules, Euclid's algorithm, GCD/LCM properties, and fundamental arithmetic theorems to solve integer-based problems.

CO2: Solve linear Diophantine equations, linear congruences, and apply these results in real-world contexts such as cryptography.

CO3: Use Fermat's and Euler's theorems, residue systems, and number theoretic functions to handle advanced modular arithmetic.

CO4: Apply the Chinese Remainder Theorem to solve simultaneous congruences and evaluate its applications in coding and cryptography.

CO5: Determine orders, primitive roots, evaluate Legendre symbols, and apply quadratic reciprocity in number theoretic problems.

CO6: Understand and apply results from the theory of equations, including the Fundamental Theorem of Algebra, root–coefficient relations, and solution of cubic and biquadratic equations.

CO7: Solve higher-degree polynomial equations using Cardano's method, synthetic division, and Descartes' Rule of Signs

Semester V

Course Title: ***Algebra – I***

Learning Outcomes (LOs):

Upon successful completion of this course, students will be able to:

LO1: Understand foundational algebraic structures including groups, rings, fields, and related substructures.

LO2: Analyze group properties such as identity, inverses, subgroup criteria, cyclicity, orders, and coset structure.

LO3: Comprehend and work with homomorphisms, quotient structures, normal subgroups, and isomorphism theorems.

LO4: Explore ring structures including zero divisors, integral domains, fields, ideals, and ring homomorphisms.

LO5: Develop the ability to apply algebraic structures to mathematical modelling in physics, computer science, economics, and engineering.

Course Outcomes (COs):

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

CO1: Identify and analyze algebraic structures including groups, subgroups, cyclic groups, and their fundamental properties.

CO2: Apply Lagrange's theorem, cyclic group results, and subgroup/normal subgroup criteria to solve algebraic problems.

CO3: Understand and use group homomorphisms, kernels, quotient groups, and isomorphism theorems in structural analysis.

CO4: Describe permutation groups, symmetric groups, alternating groups, and apply Cayley's theorem.

CO5: Classify rings, integral domains, fields, and Boolean rings and analyze properties of zero divisors and units.

CO6: Apply ring homomorphisms, quotient rings, and ideal theory including prime, maximal, and principal ideals.

CO7: Solve problems involving monoids, semigroups, cyclic group generators, and relationships between ideals and subrings.

Semester V

Course Title: ***Mathematical Modeling & Numerical Methods***

Learning Outcomes (LOs):

Upon successful completion of this course, students will be able to:

LO1: Understand the concept, purpose, and classifications of mathematical models used in real-life phenomena.

LO2: Apply mathematical modeling to problems in physics, biology, chemistry, environmental science, and social sciences.

LO3: Analyze error types (round-off, truncation, absolute, relative) and understand convergence in numerical computations.

LO4: Implement numerical methods for solving nonlinear equations, interpolation, and numerical integration.

LO5: Develop the ability to apply modeling and numerical techniques to approximate solutions where analytical methods fail.

Course Outcomes (COs):

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

CO1: Construct and classify different types of mathematical models including mechanical, biological, and chemical systems.

CO2: Apply standard models such as simple harmonic motion, projectile motion, population dynamics (logistic, exponential), and Lotka–Volterra models.

CO3: Formulate and analyze models related to **h**eat conduction, diffusion, fluid flow**,** and chemical kinetics using mathematical principles.

CO4: Compute errors and analyze rate of convergence in numerical techniques.

CO5: Solve nonlinear equations using Bisection, Regula–Falsi, Newton–Raphson, and Fixed-Point Iteration methods.

CO6: Apply Lagrange and Newton's divided difference interpolation as well as central, forward, and backward difference techniques.

CO7: Perform Hermite and spline interpolation and apply numerical integration methods such as Trapezoidal, Simpson's 1/3, and Simpson's 3/8 rules**.**

CO8: Use numerical differentiation and integration to approximate solutions in cases where analytical solutions are difficult or impossible.

Semester V

Course Title: ***Fourier and Laplace Transform***

Learning Outcomes (LOs):

Upon successful completion of this course, students will be able to:

LO1: Understand the concept of Fourier series and Fourier transforms and their use in representing periodic and non-periodic signals.

LO2: Apply Fourier series expansions, half-range expansions, and Fourier transforms to mathematical and engineering problems.

LO3: Understand Laplace transforms, inverse Laplace transforms, and their properties for solving differential equations.

LO4: Apply Fourier and Laplace transform techniques to problems in physics, engineering, and applied mathematics including heat, wave, and electrical circuit models.

LO5: Develop the ability to use convolution theorems, transform properties, and integral transforms for solving boundary value problems.

Course Outcomes (COs):

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

CO1: Construct Fourier series for periodic functions using Euler's formulae and apply Dirichlet's conditions.

CO2: Compute half-range sine and cosine series and analyze even and odd function expansions.

CO3: Evaluate Fourier transforms, inverse transforms, Fourier sine/cosine transforms, and apply transform properties including convolution.

CO4: Apply discrete Fourier transform (DFT) and fast Fourier transform (FFT) techniques to computational problems.

CO5: Compute Laplace transforms of elementary and special functions including Dirac-delta and periodic functions.

CO6: Solve ordinary differential equations using Laplace transforms and apply inverse Laplace transforms through standard techniques.

CO7: Apply Laplace transforms to solve boundary value problems, partial differential equations, electrical circuit problems, and heat/wave equations.

CO8: Use transform techniques to analyze signals in time and frequency domains relevant to physics and electronics.

Semester VI

Course Title: ***Graph Theory***

Learning Outcomes (LOs):

Upon successful completion of this course, students will be able to:

LO1: Understand fundamental concepts in graph theory including graphs, trees, connectivity, and planarity.

LO2: Analyze graph properties such as degree sequences, Eulerian and Hamiltonian structures, cut vertices, and blocks.

LO3: Comprehend planarity concepts, Kuratowski's theorems, dual graphs, and polyhedral structures.

LO4: Apply matrix representations of graphs (incidence, adjacency, Laplacian) and interpret their algebraic properties.

LO5: Use graph-theoretic ideas to model and solve problems in computer science, engineering, networks, and combinatorics.

Course Outcomes (COs):

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

CO1: Identify and classify various types of graphs, walks, paths, cycles, and graph operations.

CO2: Analyze Eulerian and Hamiltonian graphs using classical theorems such as Euler's theorem, Dirac's theorem, and Ore's theorem.

CO3: Apply criteria to verify graphical degree sequences using Wang–Kleitman, Havel–Hakimi, and Erdős–Gallai results.

CO4: Understand trees, spanning trees, binary trees, and apply Cayley's theorem to determine numbers of labeled trees.

CO5: Evaluate connectivity properties of graphs including cut vertices, cut edges, vertex/edge connectivity, and block graphs.

CO6: Determine whether a graph is planar using Kuratowski's theorem, Euler's formula, and dual graph concepts.

CO7: Apply graph matrices (incidence, adjacency, cycle, cut-set, Laplacian) and compute characteristic polynomials and graph spectra.

CO8: Use the Matrix Tree Theorem to determine the number of spanning trees in a graph.

CO9: Understand basic notions of graph coloring and matching through definitions and examples.

Semester VI

Course Title: ***Differential Equations***

Learning Outcomes (LOs):

Upon successful completion of this course, students will be able to:

LO1: Understand the theory and solution techniques for first-order, higher-order, linear, and nonlinear differential equations.

LO2: Analyze singular solutions, envelopes, and the geometric interpretation of solution curves.

LO3: Solve systems of simultaneous differential equations and interpret total differential equations.

LO4: Understand the origin, formation, and classification of partial differential equations (PDEs).

LO5: Apply analytical methods such as Lagrange's and Charpit's techniques to solve first-order PDEs.

LO6: Relate differential equations to real-life dynamical models across physics, biology, engineering, and natural sciences.

Course Outcomes (COs):

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

CO1: Solve first-order and higher-degree differential equations solvable for xxx, yyy, and ppp, including Clairaut-type and linear equations.

CO2: Solve linear homogeneous and non-homogeneous differential equations with constant coefficients using classical methods including variation of parameters.

CO3: Analyze singular solutions, envelopes, discriminants, and determine complete and singular primitives.

CO4: Apply the method of Frobenius using indicial equations to obtain series solutions of second- and higher-order differential equations.

CO5: Solve simultaneous differential equations and total differential equations, and understand their geometric interpretations.

CO6: Determine solution matrices, fundamental sets of solutions, and Wronskian properties for systems of differential equations.

CO7: Formulate first-order partial differential equations and solve them using Lagrange's and Charpit's methods.

CO8: Apply differential equation techniques to model and analyze real-life physical and dynamical processes.

Semester VI

Course Title: ***Advanced Calculus***

Learning Outcomes (LOs):

Upon successful completion of this course, students will be able to:

LO1: Understand fundamental concepts related to functions of several variables including limits, continuity, partial derivatives, and differentiability.

LO2: Apply higher-order partial derivatives, chain rule, total differentiation, and transformation rules in multivariable calculus.

LO3: Use Jacobians and Taylor's theorem to study changes of variables and local approximations in two and three dimensions.

LO4: Analyze and solve optimization problems involving multiple variables with and without constraints using Lagrange multipliers.

LO5: Evaluate double and triple integrals and apply Green's theorem, surface integrals, and volume integrals in multivariable contexts.

Course Outcomes (COs):

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

CO1: Determine limits, continuity, and differentiability of functions of two variables and apply mean value theorem in multivariable settings.

CO2: Compute higher-order partial derivatives, apply Young's and Schwarz's theorems, and use the chain rule for composite functions.

CO3: Evaluate Jacobians and use change of variables techniques for integration and transformation in two and three dimensions.

CO4: Apply Taylor's theorem for functions of two variables and solve optimization problems, including constrained optimization using Lagrange multipliers.

CO5: Compute double integrals over rectangular and general bounded domains and use Green's theorem for plane regions.

CO6: Evaluate line integrals, surface integrals, and triple integrals in R^3

as applied to geometry and physical problems.

CO7: Apply multivariable calculus tools to solve a variety of real-life problems in engineering, physics, and applied sciences.

COURSE OUTCOME - Physics

Department of Physics
Government Degree College
TRAL -192123 (Kashmir)

PROGRAMME OFFERED: B. SC.

Course Outcomes (COs)

1st Semester

PHY122J: PHYSICS – Mechanics

After completing this course, the student will be able to:

- **CO1:** Demonstrate a clear understanding of the fundamental principles and laws of Mechanics.
- **CO2:** Explain and apply various coordinate systems to analyse physical situations.
- **CO3:** Apply the laws of conservation of momentum and energy in solving mechanical problems.
- **CO4:** Describe the concept of gravity and the physical laws governing gravitational interactions.
- **CO5:** Solve basic analytical problems involving motion, forces, work–energy, and momentum.

2nd Semester

PHY222J: PHYSICS – Electricity and Magnetism

Course Outcomes (COs)

After completing this course, the student will be able to:

- **CO1:** Demonstrate a thorough understanding of the fundamental concepts of electricity and magnetism.
- **CO2:** Explain and apply the basic laws governing electric fields, electric potential, and electric current.
- **CO3:** Describe the principles of magnetic fields, magnetic forces, and electromagnetic induction.
- **CO4:** Apply Maxwell's equations and related laws to analyse electromagnetic phenomena.

- **CO5:** Solve numerical and conceptual problems related to electric and magnetic systems.

3rd Semester

PHY322J: PHYSICS – Waves and Optics

Course Outcomes (COs)

After completing this course, the student will be able to:

- **CO1:** Explain the principles of simple harmonic motion and apply the superposition principle to physical systems.
- **CO2:** Describe vibrations in strings and analyse different types of wave motion in various media.
- **CO3:** Interpret the phenomenon of interference as a result of superposition of waves from coherent sources.
- **CO4:** Understand and distinguish between Fresnel and Fraunhofer diffraction, and apply these concepts to optical systems.
- **CO5:** Explain the concepts of polarization, analyse its applications, and understand the basics of holography.

4th Semester

PHY422J1: PHYSICS – Thermal Physics

Course Outcomes (COs)

After completing this course, the student will be able to:

- **CO1:** Demonstrate a clear understanding of the fundamental laws and principles of thermodynamics.
- **CO2:** Analyse thermodynamic systems using concepts such as work, heat, internal energy, and entropy.
- **CO3:** Apply thermodynamic relations and equations of state to solve thermal physics problems.
- **CO4:** Explain thermodynamic processes and cycles, and evaluate their efficiency and applications.
- **CO5:** Relate thermodynamic principles to real-world physical, chemical, and engineering systems.

4th Semester

PHY422J2: PHYSICS – Mathematical Physics-I

Course Outcomes (COs)

After completing this course, the student will be able to:

- **CO1:** Demonstrate a solid understanding of essential mathematical methods used in physics.
- **CO2:** Apply vector calculus, differential equations, and complex analysis to solve physical problems.
- **CO3:** Use matrices, linear algebra, and operator techniques to analyse physical systems.
- **CO4:** Employ statistical tools and probability concepts relevant to physics and engineering applications.
- **CO5:** Integrate mathematical techniques to model, interpret, and solve complex problems across physics and other scientific disciplines.

4th Semester

PHY422J3: PHYSICS – Nuclear Physics

Course Outcomes (COs)

After completing this course, the student will be able to:

- **CO1:** Demonstrate a thorough understanding of fundamental concepts in nuclear structure and properties.
- **CO2:** Explain various types of radioactive decay processes and their characteristics.
- **CO3:** Describe nuclear reactions, reaction mechanisms, and energy considerations in nuclear processes.
- **CO4:** Understand the principles of radiation physics and evaluate the interaction of radiation with matter.
- **CO5:** Apply safe handling practices and protection measures for working with radioactive materials and radiation sources.

.

5th Semester

PHY522J1: PHYSICS – Modern Physics

Course Outcomes (COs)

After completing this course, the student will be able to:

- **CO1:** Explain the foundational concepts of quantum theory and relativity.

- **CO2:** Describe the behaviour of matter and radiation at atomic and subatomic scales.
- **CO3:** Analyse models of atomic structure, including Bohr's theory and quantum mechanical descriptions.
- **CO4:** Understand nuclear properties, particle interactions, and modern experimental techniques.
- **CO5:** Apply principles of modern physics to technological applications and contemporary research areas.

5th Semester

PHY522J2: PHYSICS – Mathematical Physics–II

Course Outcomes (COs)

After completing this course, the student will be able to:

- **CO1:** Understand and apply the principles of complex analysis to solve physical problems.
- **CO2:** Use Fourier series and Fourier transforms for analysing periodic and non-periodic functions.
- **CO3:** Apply Laplace transforms to solve differential and integral equations encountered in physics.
- **CO4:** Formulate and solve partial differential equations relevant to heat, wave, and diffusion processes.
- **CO5:** Understand and use special functions (Legendre, Bessel, Hermite, etc.) in mathematical modelling of physical systems.

5th Semester

PHY522J3: PHYSICS – Electronics

Course Outcomes (COs)

After completing this course, the student will be able to:

- **CO1:** Explain the working principles of semiconductor materials and devices (diodes, transistors, etc.).
- **CO2:** Analyse electronic circuits involving amplifiers, oscillators, and operational amplifiers.

- **CO3:** Understand the fundamentals of digital electronics, including logic gates and combinational circuits.
- **CO4:** Apply Boolean algebra and number systems to design digital systems.
- **CO5:** Identify practical applications of electronic components in communication, instrumentation, and control systems.

B.Sc. Semester – 6

PHY622J1: PHYSICS – Statistical Physics

Course Outcomes (COs)

After completing this course, the student will be able to:

- **CO1:** Explain the foundational principles of statistical mechanics and thermodynamics.
- **CO2:** Apply microcanonical, canonical, and grand canonical ensembles to describe physical systems.
- **CO3:** Analyse the behaviour of ideal gases, real gases, and radiation using statistical methods.
- **CO4:** Understand quantum statistics, including Bose-Einstein and Fermi-Dirac distributions.
- **CO5:** Solve problems related to entropy, partition functions, and thermodynamic potentials in various physical contexts.

B.Sc. Semester – 6

PHY622J2: PHYSICS – Classical Mechanics

Course Outcomes (COs)

After completing this course, the student will be able to:

- **CO1:** Demonstrate a strong understanding of Lagrangian and Hamiltonian formulations of mechanics.
- **CO2:** Apply variational principles and Euler–Lagrange equations to analyse physical systems.
- **CO3:** Use Poisson brackets and canonical transformations in the study of dynamical systems.
- **CO4:** Analyse small oscillations and normal modes in mechanical systems.

- **CO5:** Solve advanced problems involving rigid body motion and central force dynamics.

B.Sc. Semester – 6

PHY622J3: PHYSICS – Astrophysics

Course Outcomes (COs)

After completing this course, the student will be able to:

- **CO1:** Describe the fundamental concepts of astrophysics and the physical properties of celestial objects.
- **CO2:** Explain the structure, classification, and life cycles of stars.
- **CO3:** Analyse stellar evolution processes, including nucleosynthesis and end-states of stars.
- **CO4:** Understand the physical principles governing galaxies, nebulae, and other cosmic structures.
- **CO5:** Apply astrophysical methods to interpret observational data and cosmic phenomena.

Department of Punjabi

Government Degree College Tral

Department of Punjabi was established in the year 2005. The department is offering undergraduate and Honours course in Punjabi Literature. The course outcomes and learning outcomes of the department are as under:

Course Outcomes

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

Understand, speak, read, and write Punjabi with clarity, accuracy, and fluency. Interpret poetry, prose, drama, and fiction from various literary periods and genres. Explain how Punjabi literature reflects societal values, traditions, and historical movements. Describe phonetics, morphology, syntax, and semantics of the Punjabi language. Write essays, reviews, and creative compositions using appropriate style and structure. Recognize the significance of Punjabi folklore, Sufi/Bhakti traditions, and modern literary movements. Use reference tools, conduct textual analysis, and prepare academic assignments.

Learning Outcomes

The students will be able to demonstrate strong command over Punjabi language in reading, writing, speaking, and comprehension. Read Punjabi texts with correct pronunciation and comprehension. Write grammatically correct sentences, paragraphs, and essays. Communicate effectively in Punjabi in academic and everyday settings. Identify key authors, literary movements, and historical phases of Punjabi literature. Analyze characters, themes, and stylistic features in major Punjabi works. Compare classical and modern Punjabi literary traditions. Explain Punjabi folk tales, songs, proverbs, and cultural symbols. Understand the contribution of Sikh, Sufi, and Bhakti movements to Punjabi literature. Prepare critical essays and reports on literary works. Compose short stories, poems, or reflective essays in Punjabi. Use dictionaries, encyclopedias, and digital archives related to Punjabi studies. Present seminar papers and participate in discussions using academic Punjabi. Develop interest in Punjabi language and literature that encourages lifelong engagement with reading, research, and cultural preservation. Use digital tools for research, documentation, content creation, and preservation of Punjabi language resources.