SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR IN HISTORY JAMMU AND KASHMIR PUBLIC SRVICE COMMESSION 2023

Unit I

I. Sources: Archaeological and Literary

II. Pre and Proto Historic Cultures—Paleolithic, Mesolithic, Neolithic and Chalcolithic: Major Sites and Tools

III. Indus Valley Civilization: Material Features and Decline

IV. Vedic Ages: Polity, Society, Economy and Religion.

V. India Between c. 600-300 BCE: Mahajanapadas, Urban Centers and Heterodox Religious Movements

Unit II

I. Mauryan Empire: Polity, Economy, Society, Ashoka's Dhamma and Decline

II. India Between 200 BCE and 300 CE- Indo-Greeks, Sakas and Kushanas: Impact

III. Sangam Age: Society and Culture

IV. Guptas: Polity, Economy and Culture

V. Harshavardhana: Administration, State of Buddhism

VI. Early Medieval India-Polity, Economy and Society-Changes and Continuities

Unit III

I. Sources of Medieval India

II. Foundation and Expansion of Delhi Sultanate under Ilbaris, Khalijis and Tughlaqs

III. Administration under Sultans; Central and Provincial

IV. Economy under Sultanas

V. Devotional Movements: Bhakti and Sufism

VI. Vijaynagra Empire and Bahamani Kingdom: Polity, Economy and Culture

Unit IV

I. Foundation and Expansion of Mughal Empire

II. The Sur Interregnum: Contribution of Sher Shah Suri

III. The Consolidation of Mughal rule under Akbar: Mansabdari, Jagirdari system and Religious Policy

IV. Administration Under Mughals: Central, Provincial and Local

V. Economy under Mughals

VI. Religious Revivalist Movements

VII. Architecture and Painting

VIII. Decline of Mughal Empire

Unit V

I. Eighteenth Century India: Emergence of Regional Powers

II. European penetration and the Foundation of British Rule

III. Expansion and Consolidation of British rule: Tools (Subsidiary Alliance and Doctrine of Lapse); Civil services and Judiciary

IV. Pre-1857 Peasant and Tribal Uprisings: Causes and Nature

V. Revolt of 1857: Causes, Nature, Failure and Significance

VI. Foundation of Indian National Congress and Muslim League

VII. Constitutional Changes: Regulating Act, Pitts India Act, Charter Acts, Govt. Of India Acts 1909-1935

VIII. Gandhian Movements: Nature and Significance

IX. Non-Brahman and Dalit Politics

Unit VI

I. Communalism; Freedom and Partition

II. Princely India: Emergence, Polity, Economy, Society; Integration of Princely States

III. Colonial Economy and Society: Agrarian Settlements, Famines, De-industrialization, Rise of Modern Industries, Modern Education and Socio-religious Reform Movements; Colonial Social Policy

IV. Overseas Trade and Fiscal Policy

V. Legacies of Colonialism and Indian National Movement

VI. Making of Indian Constitution: Salient Features

VII. Abolition of Landlordism and New Industrial Policy

VIII. Foreign Policy Initiatives: Non-alignment Movement, Liberalization, Privatization and Globalization.

Unit VII

I. Geographical Explorations: Causes and Impact

II. Renaissance and Reformation and Enlightenment

III. American and French Revolution

IV. Industrial Revolution

V. World War-I and Russian Revolution

VI. Economic Depression of 1929

Unit- VIII

I. Rise of Fascism and Nazism

II. World War-II and Formation and Role of UNO

III. Cold War and Non-Alignment Movement

IV. Apartheid and Feminism

V. Failure of USSR Economy; Emergence of USA as an Economic Power.

VI. Neo-colonialism and Globalization

Unit- IX

I. Prominent Historiographical Traditions: Greeko-Roman, Chinese, Christian and Muslim

II. Renaissance and Enlightment Historiography

III. Positivism and Material Interpretation to History

IV. Constructionist/Re-constructionist Approaches to History

V. Annals School

VI. Revisionist: Antonio Gramci, E. P. Thompson

VII. Deconstructionist Approach: Foucault; Critique on Post-Modernism

VIII. Subaltern Historiography

Unit- X

I. Foundation of Jammu and Kashmir State: Treaties of Lahore and Amritsar

II. Position of Jammu and Kashmir vis-a-via British Paramountcy

III. Nature of Dogra State and Establishment of British Residency

IV. Towards Modernization of the State: Bureaucracy. Land Settlements, Education and Healthcare

V. Emergence of Political Awakening and Uprising of 1931

VI. Foundation of Muslim Conference and its Conversion

VII. Naya Kashmir Manifesto and Abolition of Landlordism

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR ARABIC

UNIT-1

الشعر العربي حتى العصر العباسي

(Arabic Poetry up to Abbasid Period)

أ - أصل اللغة العربية

ب - المعلقات وشعراؤها:

- امرؤ القيس
- عمرو بن كلثوم
- زهير ابن أبي سلمى

ت - الشعراء الصعاليك:

- تأبط شرا
- الشنفري
- عروة بن الورد

ث - الشعراء المخضرمون:

- حسان بن ثابت
- الخنساء بنت تماضر
- كعب بن زهير

ج - الشعراء الأمويون:

- عمر ابن أبي ربيعة
- جميل بن معمر
- الأخطل
- الفرزدق
- جرير

ح - شعراء العصر العباسي:

- بشار بن برد
- أبو نواس
- أبو تمام
- البحتري
- المتنبي
- أبو العلاء المعري

UNIT-2

النثر العربي حتى العصر العباسي

(Arabic Prose up to Abbasid Period)

أ - الخطابة في العصر الجاهلي:

- قس بن ساعدة الأيادي
- الأكثم بن صيفي التيمي

ب - القرآن الكريم والحديث النبوي وأهميتهما الأدبية

ت - الخطابة في العصر الإسلامي:

- علي ابن أبي طالب
- زياد ابن أبيه
- الحجاج بن يوسف الثقفي

ث - الرسائل:

- عبد الحميد الكاتب
- الجاحظ
- القاضي الفاضل
- ابن العميد

ج - المقامات:

- بديع الزمان الهمذاني
- أبو محمد القاسم بن علي الحريري

ح - القصص والحكايات:

- كليلة ودمنة
- ألف ليلة وليلة

UNIT-3

أدب المهجر والأدب الأندلسي

(Migrant and Andalusian Literature)

أ - أدب المهجر

- جبران خليل جبران
- إيليا أبو ماضي
- ميخائيل نعمية
- رشيد سليم الخوري
- ميشال معلوف
- إلياس فرحات

ب - الأدب الأندلسي:

- الموشحات
- الأزجال
- شعر الطبيعة

كبار الشعراء والشواعر:

- ابن دراج القسطلي
- ابن خفاجة
- ابن هانئ
- ابن زيدون
- ولادة بنت المستكفي
- حمدونة بنت زينب

كبار أعلام النثر:

- ابن حزم
- ابن طفيل
- ابن شهيد
- ابن عبد ربه

UNIT- 4

النقد الأدبي وأعلامه

(Literary Criticism and Prominent Critics)

أ - النقد في العصر الجاهلي والإسلامي

ب - النقد في العصر العباسي:

- ابن سلام الجمحي
- ابن قتيبة الدينوري
- قدامة ابن جعفر
- ابن رشيق القيرواني
- أبو القاسم بشر الآمدي
- عبد القاهر الجرجاني

ت - النقد في العصر الحديث:

- ❖ الاتجاهات البارزة
- ❖ المناهج
- ❖ المقائيس
- ❖ الأعلام:
  - حسن المرصفي
  - طه حسين
  - عباس محمود العقاد
  - أحمد الشايب
  - محمد مندور
  - ميخائيل نعيمة
  - شوقي ضيف

UNIT-5

علم البلاغة والعروض

(Rhetoric and Prosody)

أ - علم البلاغة:

- الفصاحة
- البلاغة

❖ علم المعاني:

- الخبر وأقسامه
- الإنشاء وأقسامه

❖ علم البيان:

- التشبيه وأقسامه
- الاستعارة وأقسامها
- الكناية وأقسامها
- المجاز وأقسامه

❖ علم البديع:

- المحسنات اللفظية: الجناس والسجع ورد العجز على الصدر
- المحسنات المعنوية: الطباق والتورية والمقابلة

ب - علم العروض:

- البحر الطويل
- البحر البسيط
- البحر الكامل
- البحر الخفيف

UNIT- 6

أهم المصادر والمراجع العربية

(Important Arabic Sources and References)

- كتاب الأغاني لأبي الفرج الأصفهاني
- البيان والتبيين للجاحظ
- مقدمة ابن خلدون
- العقد الفريد لابن عبد ربه
- الكامل للمبرد
- الفهرست لابن النديم
- معجم الأدباء لياقوت الحموي
- الخصائص لابن جني
- المزهر للسيوطي
- كشف الظنون لحاجي خليفة
- وفيات الأعيان لابن خلكان
- الأعلام لخير الدين الزركلي

UNIT-7

الأدب العربي الحديث

(Modern Arabic Literature)

أ – الاتجاهات الشعرية الحديثة:

- ❖ الكلاسيكية
- ❖ الرومانسية
- ❖ أعلام الشعر العربي الحديث:
  - محمود سامي البارودي
  - أحمد شوقي
  - حافظ إبراهيم
  - خليل مطران
  - أبو القاسم الشابي
  - بدر شاكر السياب
- ❖ الرمزية
- ❖ الواقعية
  - نازك الملائكة
  - نزار قباني
  - عبد الله البردوني
  - فدوى طوقان
  - محمود درويش
  - علي أحمد سعيد أدونيس

ب - النثر

المقالة:

- رفاعة رافع الطهطاوي
- محمد عبده
- مصطفى لطفي المنفلوطي
- غادة السمان
- أحمد أمين

القصة القصيرة:

- محمود تيمور
- إحسان عبد القدوس
- يحي حقي
- بهاء طاهر
- يوسف إدريس
- زكريا تامر

الرواية:

- ❖ اتجاهات الرواية الحديثة
- ❖ الأعلام:
  - جرجي زيدان
  - محمد حسين هيكل
  - نجيب محفوظ
  - عبد الحميد جودة السحار
  - عبد الرحمن منيف
  - حنا مينا
  - أحلام مستغانمي
  - إبراهيم الكوني
  - عبد الكريم غلاب
  - نجيب الكيلاني
  - رضوى عاشور
  - نوال السعداوي

المسرحية:

- مارون النقاش
- توفيق الحكيم
- سعد الله ونوس
- عبد القادر علولة
- عزيز أباظة
- على أحمد باكثير
- أحمد شوقي

UNIT- 8

النحو والصرف

Arabic Syntax and Morphology

أ- النحو العربي:

- المرفوع من الأسماء
- المنصوب من الأسماء
- المجرور من الأسماء
- الاستثناء
- التمييز
- الحال
- التوابع

ب- الصرف العربي:

- الفعل بالنظر إلى بنيته: الفعل الصحيح والفعل المعتل
- الفعل بالنظر إلى تركيبه: الفعل المجرّد والفعل المزيد، أبواب الفعل المجرّد والمزيد فيه.
- الفعل بالنظر إلى معموله: الفعل اللازم والفعل المتعدي
- الفعل بالنظر إلى تصريفه: الفعل الجامد والفعل المتصرف
- الاسم الجامد والمشتق
- الأسماء المشتقة: اسم الفاعل، اسم المفعول، اسم الظرف، صيغ المبالغة
- الاسم المقصور والمنقوص والممدود

UNIT- 9

الأدب العربي الهندي

(Indo-Arabic Literature)

أ- **أعلام النثر:**

- الشاه ولي الله الدهلوي
- نواب صديق حسن خان القنوجي
- عبد الحي الحسني
- حميد الدين الفراهي
- عبد العزيز الميمني
- أبو الحسن علي الحسني الندوي

ب- **أعلام الشعر:**

- فيض الحق الخير آبادي
- فيض الحسن السهارنفوري
- أنور شاه الكشميري
- محمد ناظم الندوي
- عبد القادر الفضفري
- غلام علي آزاد البلغرامي

ت- **أهم المؤلفات الهندية:**

- حجة الله البالغة للشاه ولي الله الدهلوي
- تاج العروس للزبيدي البلغرامي
- سبحة المرجان في آثار هندوستان لغلام علي آزاد البلغرامي
- أبجد العلوم للقنوجي
- تحفة المجاهدين لأحمد زين الدين المليباري
- الثقافة الإسلامية في الهند لعبد الحي الحسني
- الإعلام بمن في الهند من الأعلام (نزهة الخواطر وبهجة المسامع والنواظر
- رجال الهند والسند للقاضي أطهر المباركفوري
- ماذا خسر العالم بانحطاط المسلمين لأبي الحسن الندوي
- مطلب الطالبين للشيخ يعقوب الصرفي

UNIT-10

الترجمة العربية - الإنكليزية - العربية والتطبيقات اللغوية والمعلومات العامة

Arabic –English-Arabic Translation, Language Applications and General Knowledge

أ - الترجمة:

- مفهوم الترجمة وأقسامها وتكنياتها البارزة
- مصطلحات سياسية عامة في الصحف والجرائد
- مصطلحات اقتصادية عامة في الصحف والجرائد
- الترجمة الصحفية من العربية إلى الإنجليزية
- الترجمة الصحفية من الإنجليزية إلى العربية
- تعبيرات عربية شائعة في الصحف والجرائد
- استخدام الصلات في الترجمة

ب - المعلومات العامة عن العالم العربي

- الأنظمة السياسية
- الأنظمة الاقتصادية
- الفنون الشعبية
- الأعياد والمناسبات الخاصة

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR SOCIAL WORK

Unit I Social Work Profession

- Concept of Social Work, Social Work Profession, Methods of Social Work.
- Development of Social Work in UK, USA and India.
- Charity Approach to Social Work Profession Ideologies and Movements in Social Work Practice: Christian Ideology, Islam, Gandhian Ideology and Ambedkar's Ideology, Hindu Reform Movements and Muslim Reform Movements.
- Social Work Values and Code of Ethics.
- Challenges of Social Work Practice in India.
- Theories and Approaches of Social Work: Systems, Radical, Existential, Feminist, Critical Theory, Evidence Based Practice.

Unit II Society, Human Behaviour and Communities

- Sociological Concepts: Social Structure, Social Institutions and Social Groups, Socialization, Social Control and Social Change.
- Approaches to the study of Society: Functionalist, Conflict/Dialectical, Structuralism and Post Modernism.
- Social System and Stratification: Major Social Systems (Family and Religion), Social Stratification: Marxist, Functionalist and Weberian approach.
- Human Behaviour: Normal and Abnormal Behaviour Determinants and Life span perspective of Human Development, Development Tasks and Hazards during Pre Natal-Period, Infancy, Babyhood, Childhood, Puberty, Adolescence and Adulthood.
- Theories of Personality: Psycho Analytic Theory of Personality, Behavioural theories and Humanistic theories.
- Social Psychology: Social Perception, Attitude formation, Change and Measurement, Communication and Theories of Collective Behaviour.
- Type of Communities: Rural, Urban, Tribal and Virtual Communities and various Vulnerable Groups/ sections viz. Women,Child, Aged, Dalits etc; Caste and Class – Their Characteristics.

Unit III Social Work with Individuals

- Meaning concept and objectives of case work. Historical evolution of case work. Philosophical assumptions underlying case work. Components in case work.
- Process in case work - Intake, study Assessment, Intervention Termination and Evaluation.
- Skill and techniques in social case work – Tools and techniques like recording, home visits, Interview, observation– Therapeutic approach to person, problem, place and process social diagnosis and social treatment.
- Application of Case Work in social settings like – Community, Educational Institutions, Hospitals, Correctional Institutions, Industries.
- Management of various welfare facilities for workers using Case Work principles
- Approaches to Social Case Work Practice: Diagnostic and Functional Approach, Problem Solving, Task Centred and Radical Approach.

Unit IV Group Work

- Group, importance and place in society.
- Historical Evolution of Social Group Work.
- Social Group Work: Concept, assumptions & objectives.
- Theories of group formation.
- Group work process –Analysis and assessment – Treatment – Evaluation and termination, Stages of Group Development.

- Group Work skills – Using of programme media and participatory training methodologies – Buzz group, role play, brain storming etc. Application of sociogram in group process — conflict management and group dynamics.

Unit V Community Organisation and Social Action

- Community Organisation: Concept, Objectives, Principles and scope, emerging trends
- Models of Community Work Practice: Locality Development Model, Social Planning Model, Social Action Model. (Jack Rothman's Model) General Content, Specific Content and Process Content (Murray G. Ross' Model). Weil and Gamble: Models and Orientations, Community Empowerment: Hanna & Robinson models of Community Empowerment.
- Process of Community Organisation.
- Social Action: Concept and Process, Social Action: Principles of Social Action, Models and Strategies, Social Action and Contemporary Issues.
- Role of Participatory Rural Appraisal, Self Help Groups, Community Based Organisations and Non- Governmental Organisations in effective Community Organisation.
- Local Self Government, Panchayath Raj Institutions and Social Welfare Programmes and their role in enhancing Community development Skills and Roles of Community organisation practitioners.

Unit VI Administration

- Social Welfare Administration: Meaning, History, Principles, Nature and Type of Organizations.
- Types of Administration:Distinction between Social Welfare Administration, Public administration and Social Security administrations.
- Formation of Social Work based organisation.
- Registration of NGOs under the Societies Registration Act, Indian Trust Act and Cooperative Society's Act.
- Components of Administration: Planning, Coordination, Staff Recruitment, Training and Development, Recording and Documentation, Budgeting, Monitoring and Evaluation, Networking and Maintaining Public Relations.
- Financial Administration – Budgeting Fund Raising for social welfare organisation and NGOs Accounting and Auditing and the concept of financial transparency – Indian Income Tax Act. Programme Administration – Programme/ Project Planning – Project proposal – skill of developing Project proposal.

Unit VII Social Work Research

- Social Work Research, types and steps.
- Variables & Causation, Deduction & Induction.
- Levels of Measurement, reliability & validity.
- Problem Definition, Research Question & Hypothesis.
- Research Designs.
- Sampling: Probability Sampling, Non-Probability Sampling.
- Methods & Tools of Data Collection, Data Analysis, including use of measures of Central Tendency, Variability, Correlation & Association.
- Qualitative Research: Social construction of knowledge & rationale of qualitative research, Tools and Techniques, including analysis Ethnography, Narratives, Grounded Theory, Content Analysis.
- Writing: Field notes, FGD transcripts, Reports.

Unit VIII Social Policy, Planning and Social Development

- Social Policy: Concept, Goals, Scope, Context and Models of Social Policy and applicability in Indian context.
- Historical Development: Evolution and Historical perspective of various Policies, Implementation of Social Policies especially for Marginalized and Vulnerable sections of the society.
- Process of Policy Formulation: Determinants and Steps, Approaches to Social Policy formulation, Impact of changing Political Scenario in a country.
- Social Planning; Concept, Objectives, Scope, Models, Interrelationship between Social and Economic Planning, Social Planning in India.
- Social Development: Positive and Negative Dimensions of Social Development; Concept, Models and Theories, Historical and Social Context of Development in India,
- Sustainable Development: Concept, Strategies, Critical issues, Salient Features of Social Development. Approaches to Social Development; Similarities and Differences. SDG's, Human Development Index and Indicators for Policies and Programmes.

Unit IX Areas of Social Work Practice I

- Medical Social Work and Psychiatric Social Work: Concept, Evolution, Roles, Functions / Responsibilities of Medical Social Workers and Psychiatric Social Workers.
- Mental Health and Disease: Normal and abnormal behaviour, Epidemiology, Etiology, Types, Clinical Manifestation and Management of Schizophrenia, Mood Disorders, Neurotic Disorders, stress related Disorders, Somatoform Disorders, Child and Adolescent Mental Health Problems, Legislations related to Mental Health.
- Persons with Disabilities: Models of Disability, Disability Movement – Historical Perspective, National and International Milestones from Welfare to Right based Approach, Legislative Measures and Social Work Interventions.
- Gender and Development: Expressions of Gender Disparity in Education, Health, Property, Employment and Livelihood, Decision Making, Feminization of Poverty and Manifestations of Gender based Violence. Constitutional & Legislative Safeguards and Social work Interventions.
- Labour Welfare & Human Resource Management (HRM): Historical background of Industrial Development as a sub-system of society, Concept of Labour Welfare, Nature, Objectives, Principles, Theories, Principles of labour welfare, Labour Legislations, Human ResourceManagement : Concept, Scope, Evolution, Theories, Models, Sub-systems, Human Resources Development (HRD) - Performance Management System, Types, Six Sigma, ISO, Total Quality Management, Corporate Social Responsibility(CSR) - Concept, Issues, Practices, Models, Components, Approaches and Corporate Governance.
- Personnel Management and Industrial Relations: Concept, Definition, Objectives, Scope., Functions, Determinants and Reflectors of Industrial Relations, Models of Industrial Relations, Globalization and Industry, International Labour Organization (ILO) Role, Functions; Collective Bargaining, Job Analysis, Manpower Planning, Organization Behaviour and Organization Development Interventions.

Unit – X Areas of Social Work Practice II

- Social Defence: Concept, Philosophy and Changing Dimensions, Children in Need of Care and Protection, Juveniles in Conflict with law, Street and Working Children and Young Offenders, Probation and Parole. Emerging issues in Social Defence.

- Social Work with Families: Functions, Developmental Stages and Family patterns, Family Dynamics and Theoretical Models of Family Functioning (Circumflex model, Mc Master Model and Structural Model) and Social Work Interventions.
- Child Development: Concept, Philosophy and Historical context, State of Children in India - Demographic Profile, Education, and Protection.
- Policies & Programmes for Children: Constitutional Provisions, National Policy on Children, International perspective and UN convention on rights of children, Programmes and Legislative Measures related to Female Feticide, Adoption, Foster Care, Guardianship and Child Marriage and Social Work Interventions.
- Environment and Social Work: Causes and Consequences, Differential impact on Women, Poor, Marginalised Groups and Indigenous Populations. Environment in the Human Rights Perspective. Environmental Movements and social work interventions in the management, protection and promotion of the environment.
- Social Work and Disaster Management: Disaster related concept and Definitions: Hazard, Risk, Vulnerability and Disaster, different forms of natural & manmade disasters. Impact of Disaster and Disaster Management Initiatives, Pre and Post Disaster Interventions.

Jammu and Kashmir Public Service Commission

Subject : Kashmiri

Unit-I

کأشر زبان: ابتداتہٕ ارتقا

۱۔ہند اپر آنٕی تہٕ ہند آریأیی زبانہٕ: بُنیأدی زان

۲۔کأشرِ زبأنٕ ہُند آگر: مختلف نظریہ

۳۔کأشرِ چہٕ جغرافیأیی بولہٕ

۴۔کأشُر لفظِ راش : سنسکرت تہٕ فارسی اثرات

Unit-II

لل دید تہٕ شیخ العالمؒ

۱۔لل دید (جیالال کول کلچرل اکادمی سری نگر)

۲۔ شیخ العالمؒ (موتی لال ساقی، کلچرل اکادمی سری نگر)

۳۔للہٕ واکھن تہٕ شیخہٕ شرکہن ہُند شأعرانہٕ فن

۴۔فکری سرچشمہٕ: بدھ مت، شومت، ریشُت تہٕ اسلام

Unit-III

کأشر رومأنی شأعری تہٕ صوٗفی شأعری

۱۔کأشرِس منز رومأنی تہٕ صوٗفی شأعری ہنز روایت

۲۔حبہ خاتون، محمود گامی تہٕ رسول میر

۳۔کأشر صوفی شأعری ہُند گولڈنیک دور: مومن صأب، سوچھ کرأل تہٕ پرمانند

۴۔کأشرِ صوٗفی شأعری ہُند دویم دور: رحمان ڈار، نعمہٕ صأب، شمس فقیر، احمد بٹوٗ آرکہٕ تہٕ کرشن جورازدان

۵۔کأشرِ صوٗفی شأعری ہُند تریم دور: وہاب کھار، واز محمود، صمد میر تہٕ احد زرگر

Unit-IV

مثنوی

۱۔ مثنوی ہُندفن تہٕ امکی مختلف قِسم (کاشرِ مثنوی ہِندِ حوالہٕ)

۲۔ سنگتراش (میر عبداللہ بیہقی)، ہی مال نأ گر راے (ولی اللہ متو)، یوسُف زلیخاہ (محمؤ دگامی)

۳۔ گلریز (مقبؤل شاہ کرالہٕ وأردی)، گُلِ بکاؤلی (لسہٕ خانِ فدا)

۴۔ شاہنامہ (وہاب پرے حأجنی)، شاہنامہ (لکھمن جو بُلبُل)

Unit-V

کاشِر نُو شأعری تہٕ جدید شأعری

۱۔ کاشِر نُو شأعری تہٕ جدید شأعری: فکری پسِ منظر

۲۔ مہجُور، آزاد، زندِ کول تہٕ رسا جاودانی

۳۔ دینا ناتھ نادم، أمین کامل، رحمان راہی، غلام نبی فراق تہٕ ارجن دیو مجبُور

۴۔ موتی لال ساقی، قاضی غلام محمد، چمن لال چمن تہٕ حکیم منظؤر

۵۔ مظفر عأزم، غلام نبی خیال، فاروق نازکی، شفیع شوق تہٕ رفیق راز

Unit-VI

افسانہٕ

۱۔ افسانک فن: امکی ترکیبی جُز تہٕ ہیتی انہار

۲۔ سوم ناتھ زُتشی، اختر محی الدین، أمین کامل تہٕ بنسی نردوش

۳۔ ہری کرشن کول، ہردے کول بھارتی تہٕ شنکر رینہ

۴۔ رتن لال شانت، فاروق مسعؤدی، بشیر اختر تہٕ گلشن مجید

Unit-VII

ڈراما

۱۔ڈرامہٕک فن تہٕ امکی ترکیٖبی جُز

۲۔گرٕیسی سُندگرٕ (محی الدٖین حاجنی)، سُیاہ (علی محمد لون)

۳۔ژھاے (موتی لال کیمو)، ناٹک کُرو ہند ری کرشن کول)

۴۔کنگ لیر :شیکسپیر (ترجمہٕ :ناجی منور)، ترٚییہ بیٚنہٕ: رف (ترجمہٕ :رتن لال شانت)

کنیادان: وجے تنڈولکر (ترجمہٕ :شفیع شوق)

Unit-VIII

ناول

۱۔ناول: آغاز، ارتقا تہٕ ترکیٖبی جُز

۲۔اکھ دور (بنسی نردوش)، شیٖن تہٕ وتہٕ پوٚد (پران کشور)

۳۔مُجرم (غلام نبی گوہر)، جہنمُک پُٹھن پٹھن نار (اختر محی الدٖین)

۴۔وودرنگ ہایٹس (مظفر عازم)، لداخُچ ژھاے (شفیع شوق)

Unit-XI

ادبی تنقید

۱۔تنقید کیاہ گۆو: کاشرِس منٛز تنقید

۲۔افلاطوٗن، ارسطو، لانجائنس تہٕ ہوٗرس

۳۔وٲرڈس وٗرتھ، کولرج، ایلیٹ تہٕ رچاڑڈس

۴۔کلاسکیت، رومانیت، ہیت پسندی تہٕ جدیدیت

۵۔پس جدیدیت، ساختیات تہٕ پس ساختیات

Unit-X

لسانیات تہِ گرامر

۱۔زبان:تعریف تہِ اہمیت

۲۔لسانیات:اکھزان

۳۔کاشرِ زبانڑ ہُنڈ آوازیات تہِ صوتیات

۴۔کاشُر مارفیمیات

۵۔جملیات

۶۔روایتی گرامر،تغیر اُتی گرامر تہِ آفاقی گرامر

JAMMU AND KASHMIR PUBLIC SERVICE COMMISSION

Proposed Syllabus For The Post of Assistant Professor in Persian, Department of Higher Education Govt of jk UT

UNIT-I

زبان و فرهنگ ایران باستان: از دوره مادیان تا اشکانیان

زبان و فرهنگ در دوره ساسانیان

اوستا

پارسی باستان

پهلوی اشکانی

پهلوی ساسانی

UNIT-II

دوره طاهریان ،صفاریان و سامانیان

دوره غزنویان ودوره سلجوقیان.

سخن سرایان و نویسندگان و آثار برجسته:

حنظله بادغیسی

رابعه قزداری

رودکی سمرقندی

ابو شکور بلخی

دقیقی

فردوسی

عنصری

فرخی

عسجدی

منوچهری

مسعود سعد سلمان

ابو علی سینا

ابو ریحان البیرونی

بابا طاهر

ابو سعید ابی الخیر

عبد الله انصاری

سنائی

ناصر خسرو

خیام

انوری

ظهیر فاریابی

مولانا جامی

محتشم کاشانی

گلستان

تاریخ جہانگشا

جامع التواریخ

تاریخ و صاف

تاریخ گزیدہ

ظفر نامہ

اخلاق ناصری

اخلاق جلالی

اخلاق محسنی

انوار سہیلی

حبیب السیر

تاریخ عالم آرای عباسی

UNIT-IV

دورہ سلطنت دھلی

سخن سرایان و نویسندگان و آثار برجستہ:

ابوالفرج رونی

بو علی قلندر

خاقانی

نظامی

ترجمہ تاریخ طبری

تاریخ بیہقی

تذکرہ الاولیا

سیاست نامہ

چہار مقالہ

قابوس نامہ

کلیلہ و دمنہ

کیمای سعادت

سفر نامہ ناصر خسرو

UNIT-III

دورہ منگول و تیموریان و دورہ صفویان۔

سخن سرایان و نویسندگان و آثار برجستہ:

عطار

سعدی

جلال الدین رومی

عبید زاکانی

حافظ شیرازی

امیر خسرو

حسن سجزی

تاج المآثر

طبقات ناصری

کشف المحجوب

لباب الالباب

خزائن الفتوح

مقدمہ غرة الکمال

فوائد الفواد

UNIT-V

دوره مغولان ہند و بعد

سخن سرایان و نویسندگان و آثار برجستہ:

غزالی مشہدی

فیضی

عبدالرحیم خانخانان

عرفی شیرازی

نظیری نیشاپوری

طالب آملی

صائب تبریزی

قدسی مشہدی

کلیم کاشانی

داراشکوہ

چندربھان برہمن

بیدل دہلوی

آنندر رام مخلص

حزین لاہیجی

سراج الدین علی خاں آرزو

لچھمی نرائن شفیق

محمد اعظم دیدہ مری

نارائن کول عاجز

غالب دہلوی

اقبال لاہوری

ہمایون نامہ

اکبر نامہ

آئین اکبری

منتخب التواریخ

مآثر رحیمی

تزک جہانگیری

اخبار الاخیار

فرہنگ جہانگیری

شاہ جہان نامہ عبد الحمید لاہوری

عمل صالح کنبوہ

سیر المتاخرین

دستنبو

مہر نیمروز

UNIT-VI

ترویج زبان و ادبیات فارسی در جموں و کشمیر

دورہ شہمیریان ،دورہ چکان و دورہ مغولان ہند۔

الف: آغاز و گسترش زبان فارسی در جموں و کشمیر

ب: سخن سرایان و نویسندگان و آثار برجستہ:

ملا احمد کشمیری

اویسی منطقی بیہقی

شیخ یعقوب صرفی

خواجہ حبیب اللہ حبی نوشہری

بابا داود خاکی

میرم بزاز

بابا حیدر تیلہ مولہ

غنی کشمیری

ملا محسن فانی کشمیری

الٰہی ہمدانی

طغرائی مشہدی

مرزا اکمل الدین بدخشی

بابا داود مشکاتی

بابا کمال الدین

یکتا کشمیری

بحر الاسمار

چہل اسرار

ذخیرۃ الملوک

چلچلۃ العارفین

تذکرۃ العارفین

راحۃ الطالبین

ہدایت المخلصین

UNIT-VII

عهد قاچاریان،دوره مشروطه و ادبیات دوره پس از انقلاب اسلامی

سخن سرایان و نویسندگان و آثار برجسته

قآنی

نشاط

وصال شیرازی

بهار مشهدی

دهخدا

پروین اعتصامی

عارف قزوینی

لاهوتی

ایرج میرزا

نیما یوشج

عشقی

فروغ فرخزاد

نادر نادر پور

احمد حسین شهریار

سهراب سپهری

مهدی اخوان ثالث

احمد شاملو

یوشنگ ابتهاج سایه

قرة العین

قائم مقام

امیر کبیر

علی اکبر دهخدا

جمالزاده

صادق هدایت

محمد حجازی

صادق چوبک

سعید نفیسی

بزرگ علوی

فریدون توللی

ایرج افشار

علی دشتی

عبد الحسین زرین کوب

پرویز ناتل خانلری

جلال آل احمد

محمد معین

سیمین دانشور

قیصر امین پور

اطلاعات ادبی و فرهنگی درباره:

دوره باز گشت

انقلاب مشروطه

روز نامه نویسی

دارالفنون

نمایش نامه نویسی

داستان نویسی

UNIT-VIII

تاریخ نویسی فارسی در جموں و کشمیر

تاریخ نادری

تاریخ ملا احمد

تاریخ کشمیر از سید علی ماگرے

بہارستان شاہی

تاریخ حیدر ملک چاڈورہ

واقعات کشمیر

تاریخ باغ سلیمان

تاریخ کشتواڑ(پنڈت شیوجی دھر)

تاریخ کشمیر بیربل کاچرو

تاریخ کشمیر دیارام کاچرو

تاریخ کبیر

تاریخ حسن

گلاب نامہ

راگ دھرشنی

UNIT-IX

انواع ادبی،سبک های فارسی

قصیده

مثنوی

رباعی

شعر نو

شعر موج نو

شعر سپید

سبک عراقی

سبک خراسانی

سبک هندی

سبک بازگشت

محققین و منتقدین

شبلی نعمانی

بہار مشہدی

نکلسن

ای جی براون

ژان ریپکا

اے جے آربری

ذبیح اللہ صفا

UNIT-X

دورہ افغانہا،سیکھا و دوگران

راجہ سکھ جیون مل

عبد الوہاب شائق

ملا لال محمد توفیق

رحمۃ اللہ بانڈی نوید

مرزا جان بیگ

سعد اللہ شاہ آبادی

بہاو الدین متو

ملا اشرف دیری بلبل

پنڈت دیارام کاچرو

پنڈت بیربل کاچرو

سرخوش کشمیری

تذکرہ حسام الدین راشدی

پنڈت دیوان کرپارام

حمید اللہ شاہ آبادی

عبد الغفور شپیانی

Syllabus for Anthropology

Unit 1

Anthropology: History, Development and Scope. Different Branches of Anthropology. Relationship of Anthropology with other Disciplines.

Research Methodology: Ontology, Epistemology and Theoretical Paradigms, Research Design: Types and implementation strategies. Qualitative, Quantitative and Mixed Methods Research.

Sampling: Random and Non-random. Descriptive Statistics: Measures of central tendency and dispersion, parametric and nonparametric bivariate and multivariate (linear regression and logistic regression), statistical tests.

Fieldwork Tradition in Anthropology

Ethnography, Participant Observation, Interview, Case Study, Life History, Focus group Discussion, PRA, RRA, Genealogical Method, Grounded Theory, Exploration and Excavation, GIS, Narrative analysis, Content analysis, Discourse analysis, Phenomenology and Ethnomethodology.

Academic Writing and Publication, Research Ethics

Unit II

Lamarckism, Neo-Lamarckism, Darwinism, Neo-Darwinism, Synthetic theory, Neutral theory of molecular evolution, Concept of Cladogenesis and Anagenesis, Punctuated Equilibrium. Speciation and types.

Trends in Primate Radiation. Characteristics of primates: morphological, skeletal (cranial, post cranial, dental, brain), locomotion (knuckle walking, brachiation and bipedalism), Primate social behaviour.

Extant Primates, Distribution, characteristics and classification. Prosimii (Tarsiioidea, Lorisoidea, Lemuroidea), Anthropoidea (Ceboidea, Cercopithecoidea, Hominoidea).

Morphological and anatomical comparison of humans and apes.

Fossils of extinct Primates, Oligocene— Parapithecus and proparapithecus. Miocene fossils Dryopithecus, Ramapithecus and Sivapithecus.

Early hominid groups: Sahelanthropustchadensis (Toumai), Orrorintugenensis, Ardipithecus.

Hominids: Australopithecus gracile and robust forms.

Early Transitional Human: Homo habilis.

Hominid Evolution, Characteristics and distribution of Homo erectus in general, Special reference to the fossil evidences discovered from Africa (Turkana boy), Asia (Java man and Peking man), Europe (Dmanisi), Homo floresiensis (Dwarf variety)

Characteristics of Archaic sapiens with special reference to Europe (Homo heidelbergensis), Africa (Rhodesian Man), Asia (China, Jinniushan; India, Narmada Man).

Neandertal man: Distribution, salient features, phylogenetic position and extinction.

Characteristics of anatomically Modern Homo sapiens with special reference to Africa (Omo), Europe (Cro-magnon, Chancelade, Grimaldi), Asia (Jinniushan) and Australia (Lake Mungo).

Unit III

Modern Human Variation: Typological Model, Populational Model and Clinal Model; Overview of Classification proposed by Blumenbach, Deniker, Hooton, Coon, Garn and Birdsell.

Methods of studying Human Genetics: Cytogenetics, Mendelian Genetics, Twin Genetics, Sib Pair methods, Population Genetics, Molecular Genetics.

Cytogenetics: Cell cycle, Standard Karyotyping and Banding techniques (G, C and Q),chromosomal abnormalities, fluorescent in situ hybridization, Lyon's hypothesis, importance of telomere and centromere.

Linkage and chromosome mapping, epigenetics.

Modes of inheritance: Autosomal (dominant, recessive, codominance), sex linked and limited inheritance, multiple allelic inheritance, multifactorial inheritance (stature and skin colour).

Population Genetics: Hardy-Weinberg equilibrium, definition and application; mating patterns (random, assortative and consanguineous), inbreeding coefficient, genetic load, genetic isolate, genetic drift, genetic distance); genetic polymorphism (balanced and transient).

Molecular genetics: DNA, RNA, genetic code, protein synthesis, Mitochondrial DNA, genic and genomic mutations.

UNIT IV

Human Growth, Development and Maturation: definition, concepts. Basic principles of growth; phases of growth: Prenatal and postnatal (growth and development of different body parts, subcutaneous tissues and physiological variables). Growth curves: Velocity, Distance, Acceleration and Scammon's Growth curve. Catch up and Catch down growth.

Aging and senescence with special reference to somatic, skeletal and dental maturation Factors affecting growth: Genetic and Environmental. Secular trends in growth.

Methods of studying human growth: Longitudinal, Cross-sectional, Mixed longitudinal, Linked longitudinal.

Body composition: Bone mass, body mass, percentage of body fat, segmental fat, and body age. Human Adaptation: Allen's and Bergmann's rule; Human Adaptability Programme; human adaptation to heat, cold, high altitude.

Somatotyping: Concept, Development (Kretschmer, Sheldon, Parnoll, Health-Carter) and its application.

Demography: Fertility (concept and determinants), Morbidity and mortality (concept and determinants), Migration (concept and determinants), Selection intensity.

Unit V

Definition, aims and scope of archaeological Anthropology; Branches: Prehistoric, protohistoric, ethno-archaeology, experimental archaeology, environmental archaeology, settlement archaeology. Archaeological methods; Exploration, Excavation, Recording and Analytical methods; Overlap and distinction between Archaeology, Anthropology and History.

Site formation; artefacts and ecofacts.

Cultural sequence and dating methods: Prehistory, Protohistory and History; Introduction to relative dating methods; Introduction to absolute dating methods.

Paleoenvironment: Major geological stages (Tertiary, Quaternary, Pleistocene, Holocene). Major climatic changes during Pleistocene and post Pleistocene periods, glacial and interglacial periods, ice age, pluvial and inter-pluvial climatic phases. Evidences of quarternary climatic changes.

Lithic tool typology and technology: Lower Palaeolithic (pebble tools, chopper and chopping tools, bifaces, handaxes and cleavers); Middle Palaeolithic (Clactonean, Levalloisian and Mousterian flakes, discoid cores, tortoise core, fluted core, scrapers, point); Upper Palaeolithic (blade, knife, blunted back, borer, burin, points); Mesolithic (microliths); Neolithic (ring stone, grind stone, celt, adze). Prehistoric Art.

Overview of Lithic Cultures: Africa, Europe and Asia

Neolithic and Early Farming Cultures in West and East Asia (Jericho, Jarmo, Çatal Huyuk, Shanidar). Northern Neolithic Culture (Burzahom, Gufkral, Qasim Bagh and Swat).

Unit VI

Lower Palaeolithic Period in India, site types and tool typologies: Soan, Attirmpakkam, Didwana, Belan Valley, Bhimbetka, Chirki-Nevasa, Hunsgi, Krishna Valley. Importance of Hathnora, Narmada valley and Kashmir.

Middle Palaeolithic period in India: Belan valley, Bhimbetka, Nevasa, Narmada valley.

Upper Palaeolithic period in India: Patne, Bhimbetka, Son and Belan Valley, and Kashmir.

Mesolithic period in India: Mesolithic economy and society. Post Pleistocene environmental changes. Development in microlithic technology, composite tools and bows and arrows. Sites include Bagor, Langhnaj, Adamgarh, Bagor, Chopani Mando,.

Neolithic Period in India: Geographical distribution, Economic and social consequences of food production. Settlement types and craft specializations,. Sites like Burzahom, Gufkral, Ahar, Gilund, Kayatha, Navdatoli, Eran, Nevasa, Daimabad, Inamgaon, Maski, Brahmagiri, Tekkalkota, Piklihal, Nagarjunakonda,.

Prehistoric Cave art from India: Bhimbetka, Adamgarh and Kashmir.

Indus Civilization: Origin and development, geographical distribution, town planning and architecture, trade, economy, technology, art and writing. Stages and theories of decline. Sites like Mohenjodaro, Harappa, Rakhigarhi.

Bronze/Copper Age: General characteristics, distribution, people.

Iron Age and Urban Revolution: General characteristics, distribution, people.

Megaliths: concept and types (menhir, dolmen, topical, cist, cairn circle, sarcophagi)

Geological Formation of Kashmir Valley. Major archaeological sites in Kashmir from Palaeolithic to Neolithic. Detailed study of Burzuhom and Gufkral. Early historical Period.

Unit VII

Key Concepts in Social Anthropology

Culture: Attributes, Holism, Universals, Acculturation, Enculturation, Transculturation, Culture Change, Culture Shock, Cultural Relativism, Civilization, Folk-Urban Continuum, Great and Little Tradition, Cultural Pluralism and World-View.

Society: Groups, Institutions, Associations, Community, Status and Role.Types of societies: Bands, tribes, state societies. Foraging, pastoralist, horticultural, agricultural and capitalist societies.

Social Institutions:

Family: Definitions, universality of the family. Typological and Processual methods of studying the family. Types of family – conjugal-natal, consanguineal, nuclear, joint, extended. Rules of residence – Patrilocal, Matrilocal, Ambilocal, Bilocal, Neolocal, Avunculocal, Virilocal, Amitalocal, Uxorilocal. Functions of family, Trends of change – urbanization, globalization, industrialization, feminist movements.

Marriage: Definition, universality, types and functions (monogamy, polygamy – polyandry, polygyny, hypogamy, hypergamy, levirate, sororate). Preferential and Prescriptive types.Endogamy and Exogamy. Rites of passage. Universality of Incest Avoidance.

Types and forms of marital transactions – bride price and dowry. Marriage as exchange.

Kinship: Definition, Descent, kinship terminology, matrilineal puzzle. Joking and avoidance. moiety, phratry, clan and lineage. Types of kinship systems.

Economic Anthropology: Definition and relationship with Anthropology and Economy. Theories (Malinowski, Formal, Substantivist, Marxist). Livelihoods, Subsistence, Principles of production, distribution, consumption; division of labour in hunting-gathering, pastoral, swidden and agricultural communities. Exchange, reciprocity, gifts and barter systems. Kula, Potlatch and Jajmani – Anthropological explanations.

Anthropology of Law, Social Sanctions. Law as a social and communication process. Dispute resolution in simple societies. Anthropological perspectives on Uniform civil code.

Political Organization: Definitions, political processes in band, tribe, chiefdom and state systems. Conflicts and social control. Nations and Nation-state, democracy.

Religion and Belief Systems: Definitions, animism, animatism, totemism, taboo. Religious specialists – witch, shaman, priest, medicine-man, sorcerer.

Magic – definitions, types, approaches. Rituals and Ritual Liminality.

Social Change: Basic ideas and concepts (Assimilation, Integration, Syncretism, Dominance and Subjugation), Approaches.

Unit VIII

Theories in Social Anthropology:

Evolutionism – Tylor, Morgan, Fraser, Maine, McLennan. Diffusionism – Three schools (Austro-German, British, American). Historical Particularism – Boas.

Functionalism – Malinowski.

Structural-Functionalism – Radcliffe-Brown, Firth, Fortes, Eggan, Parsons.

Structuralism – Levi-Strauss and Edmund Leach

Culture and Personality/Psychological Anthropology – Mead, Benedict, DuBois, Linton, Kardiner, Whiting and Child.

Cultural Ecology, Environmental Anthropology, Neo-evolutionism (Leslie White, Julian Steward, Marshall Sahlins).

Cultural Materialism – Marvin Harris.

Symbolic Anthropology – Victor Turner, Raymond Firth, Mary Douglas.

Cognitive Anthropology – Roy D'Andrade, Stephen Tyler, Ward Goodenough.

Deep Ethnography, Interpretive Anthropology – Clifford Geertz.

Anthropology and Gender – Leela Dube, Renato Rosaldo, Marilyn Strathern, Zora Neale Hutson. Postmodernism, Poststructuralism, Postcolonialism – Foucault, Derrida, Bourdieu.

Ethnicity – Barth, Jeffery, Weber.

Unit IX

Stages in the Development of Indian Anthropology, Ethnic Classification and distribution of Indian Populations: H.H. Risley; B. S. Guha; S. S. Sarkar.

Concepts: Social Stratification (eg. Caste), Scheduled Caste (SC), Dalit, OBC, Tribe, Scheduled Tribe (ST), Particularly Vulnerable Groups (PVTGs), Tribal movements (Birsa and Naga movements), Tribal Development

Indian Village and Village Studies in India (S.C. Dube, McKim Marriott, Weiser, Scarlett Epstein, M.N. Srinivas, F.G. Bailey)

Constitutional Safeguards for SC and ST, Inclusion and Exclusion. Panchayati Raj Institutions and other traditional community political organizations, Self-Help Groups (SHGs).

Theoretical ideas: Sanskritization, Westernization, Modernization, Globalization, Sacred Complex, Nature-Man-Spirit Complex.

Early Indian Anthropologists and their contributions: G.S. Ghurye, B.S. Guha, S.C. Roy, IravatiKarve, L.P. Vidyarthi, S.C. Dube, M.N. Srinivas, N.K. Bose, Surajit Sinha, D.N. Majumdar, S.R.K. Chopra, Verrier Elwin, S.S. Sarkar, Dharani Sen, T.C. Das, P.C. Biswas.

Unit X

Concepts and Theories: Applied Anthropology, Action Anthropology, Urban Anthropology, Anthropology of Development, Medical Anthropology, Visual Anthropology.

Community Development Projects (Rural, Urban and Tribal); Revisits, Re-studies, Reinterpretations, Intervention, Research Process and Social Impact Assessment (SIA). Anthropological approaches in community studies: public health, education, nutrition, land alienation, bonded labour, housing, alternative economy, livelihood, gender issues, relief, rehabilitation and relocation, identity crisis, communication, training and management, aging and the aged.

Ethnic and linguistic diversity of Jammu and Kashmir. Major Tribal groups of Jammu and Kashmir

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR FOOD SCIENCE & TECHNOLOGY AND QUALITY CONTROL

I. Food Chemistry

Water activity and its relation to spoilage of foods. Water-solute interactions. Moisture sorption isotherms & hysteresis. Carbohydrates-Structure and functional properties of mono, oligo & poly- saccharides including starch, cellulose, pectic substances. Non-Enzymatic browning reactions in foods. Polysaccharide solubility, viscosity and stability. Starch structure, Gelatinization and pasting properties. Hydrolysis of starch. Guar gum, locust bean gum, Xanthan gum, Carrageenans, beta- glucan. Amino acid structure, acid- base properties and hydrophobicity. Proteins: structure and forces involved in stability of protein structure. Protein denaturation, thermodynamics of denaturation and denaturing agents. Functional properties including hydration, solubility and interfacial properties. Nutritional properties of proteins: protein quality, digestibility, evaluation of protein nutritive value. Lipids: Nomenclature of saturated and unsaturated fatty acids. Physical properties of triacylglycerols - rheological, density, thermal and optical properties. Crystallisation and melting of food lipids. Physicochemical transition of lipids – supercooling, nucleation, crystal growth, post crystallization events. Polymorphism in lipids. Isolation, purification and modification of lipids. Mechanism of oxidative rancidity and role of Prooxidants and antioxidants in lipid oxidation. Food lipids and health: Trans- fatty acids, omega fatty acids

II. Food Microbiology

Characteristics of microorganisms: morphology of bacteria, yeast, and mold. Microbial growth: growth and death kinetics, factors affecting microbial growth- pH, moisture content, redox potential, nutrient content and extrinsic factors. Food spoilage: spoilage microorganisms in different food products including milk, fish, meat, egg, cereals and fruit and vegetables. Food borne disease – Staphylococcal gastroenteritis, Botulism, Listeriosis, Salmonellasis, Shigillosis. Toxicants of microbial origins – Aflatoxins, ochratoxins, patulin, botulinum, enterotoxins. Types of fermentation: Solid substrate and submerged fermentation, continuous and batch fermentation. fermented foods: curd, yoghurt, cheese, pickles, sauerkraut, idli, dosa, and vinegar. Antimicrobials- benzoic acid, sulfur dioxide, propionic acid, sorbic acid, and nisin. Single cell protein-Sources, substrate requirement and Production. Enzyme immobilization: Methods and advantages.

III: Food processing and engineering

Thermal processing- Pasteurization, sterilization, Canning, and aspectic processing. Thermal process calculations- D value, Z value, F value. Calculation of process time for canned foods. Fluid flow – Viscosity and its measurement; Newtonian and non-newtonian fluids. Heat transfer - Modes of heat transfer, conduction, convection and radiation. Heat exchangers- scraped surface, double pipe, shell and tube and plate heat exchangers. Size reduction - Elastic stress limit, yield point, Kicks law, Rittengers law, Bonds law. Equipment for fibrous foods – slicing, dicing, flaking, shredding, pulping and chopping. Equipment of dry foods – ball mills, disc mills, hammer mills, roller mills. Size reduction of liquid foods-

homogenization,ultra-sonication and wet milling. Dehydration– dehydration curve, types of dryers, effect of dehydration on food quality. Intermediate moisture foods. Refrigeration, freezing and freeze drying - Components of refrigerator, freezing curves and process and construction of freeze dryer . Types of freezers- chest freezers, blast freezers, belt freezers, fluidized bed freezers, immersion freezers. Types of evaporators- Single effect evaporators, multiple effect evaporators. High pressure processing of foods- quality changes, effect of pressure on microorganisms and its application in food processing. Pulsed electric field- principle, mechanism of microbial inactivation, application of pulsed electric field. Ultrasonic in food processing- properties and generation, cavitation and application of ultrasound in food processing. Ohmic heating and microwave heating. Natural and processing induced toxins and their biotransformation in foods.

IV: Food Analysis & Quality control

Tristimulus color system & hunter lab. Atomic absorption spectroscopy and ICP. Mass spectroscopy– Instrumentation and interpretation. X- ray analysis of foods: properties, production and detection. Applications in food industry. Mass spectrometry: Instrumentation and interpretation. Chromatography– Principles of different chromatographic separations- HPLC & Gas Chromatography. Nuclear magnetic resonance (NMR): principle, components, interpretation. ELISA & PCR. Rheology measurement– Farinograph, Amylograph, Rheometer. Objectives, importance and functions of quality control. Methods of quality assessment-Subjective & objective methods. Sensory evaluation methods / training– Difference tests (Paired comparison, Duo Trio, Triangle), Rating (ranking, single sample, two sample, multiple sample, hedonic), sensitivity threshold test. National & international Food laws – Food Saftey and Standards Act 2006, Codex Alimentarius Commission. General hygiene and sanitation in food industry– GMP, HACCP. Food adulteration and food safety– Physical, chemical & biological hazards in foods. Methods of evaluation of different food adulterants. Quality evaluation of foods- fruits, vegetables, cereals, milk, egg and meat.

V: Cereal, legume and oil seed technology

Structure and chemical composition of different grains like wheat, rice, maize, barley, oats and millets. Wheat milling – principle, conditioning and milling systems. Structure and functionality of wheat proteins. Vital wheat gluten – manufacturing techniques, uses and functionality. Bread making processes, development in bread making methods, functions of ingredients/ additives such as fat, emulsifiers, oxidants, reducing agents, conditioners. Technology of biscuit, cake, cookies and cracker manufacture. Milling of rice – types of rice mill. By-products of rice milling and their utilization. Parboiling of rice. Wet and dry milling of corn. Corn products and their uses. Oil extraction from different seeds and its refining. Structure and composition of pulses, their importance in Indian diet. Dhal milling and processing of pulses. Composition, nutritional significance and processing of some millets like sorghum, pearl millet, foxtail millet and proso millet.

VI: Fruit and vegetable Technology:

Fruit maturity and ripening indices. Ethylene biosynthesis, mode of action, inhibition of ethylene synthesis. Controlled atmospheric storage – Principle, design considerations,

effects of CA storage on food quality. Modified atmospheric storage. Hypobaric storage. Zero energy cool chamber: Its construction and advantages. Chemistry of pectin, theories of gel formation. Role of enzymes in processing. Fruit & vegetable Juices: Preparation & preservation of juices syrups, cordials, Squash, concentrate pickles, tomato products. Jams, Jellies, Marmalades and preserves. Canning: spoilage of canned products. Properties of plant pigments (chlorophyll, anthocyanins and carotenoids). Effect of processing on these pigments. Processing of tea, coffee and cocoa. Waste utilization for sustainability and circular economy. Minimally processed fruit and vegetables.

VII: Technology of milk and milk products

Sources and composition of milk, nutritive value. Storage, transportation and distribution of milk. Processing of market milk- standardization, toning of milk, homogenization, Pasteurization, sterilization and UHT. Milk products - Processing of ice cream, cream, butter oil, condensed milk, evaporated milk, whole and skimmed milk. Cheese – cheese making process, types of cheese, ripening of cheese and defects of cheese. Processing Technology of traditional milk products of Jammu and Kashmir: Kalari/ Kaladi, Churpi and Kudaan.

VIII: Technology of meat, fish and poultry products

Sources of meat, composition and nutritive value of meat. Structure of muscle. Factors affecting meat production and quality. Slaughtering of animals and poultry. Post mortem changes in meat. Meat tenderization and aging. Preservation of meat by freezing, curing, and smoking. Myoglobin- structure and properties. Structure, composition, nutritive value and functional properties of eggs. Factor affecting egg quality and measures of egg quality. Preservation of eggs by different methods. Fish – composition & structure. Post mortem changes in fish. Preservation of fish by freezing, glazing of fish, canning, smoking, freezing, irradiation and dehydration Technology of production of fish sausage, fish meal and fish oil.

IX: Food packaging and additives

Definition and functions of packaging. Migration of contaminants and its testing. Metals: Tinplate containers, tinning process, Low tin steels, tin free steel (TFS). Can-manufacturing, types and lacquering. Plastics: chemistry and properties, polymerisation. Barrier properties of packaging materials: gas transmission rate (GTR) and water vapour transmission rate (WVTR). Polymer processing. Innovative technologies in food packaging: active packaging, intelligent packaging and anti microbial packaging; application and technologies. Biodegradable packaging, types advantages and disadvantages. Packaging requirements- Dairy, cereal, meat, spices, fruit & vegetable. Food packaging- regulations and labeling. Definition and classification of additives. Natural and synthetic colorants used in foods. Artificial flavours, flavor enhancers and sweeteners used in foods.

X: Recent developments in Food Science and Technology

Nutraceuticals and functional foods: Probiotics, prebiotics and Synbiotics, Omega-3 fatty acids metabolism, Phytochemicals and antioxidants, biosynthesis of phenolic

compounds, Dietary fibre –physical and physiological properties. Nanotechnology applications in food processing and packaging. Concept of nano sensors. Micro and nano encapsulation techniques for retention and controlled release of bioactive compounds like Microfluidization, electrospinning, Spray drying, extrusion, Coacervation, freeze drying, wet milling and emulsification. Alternate proteins for meat, dairy and egg. High moisture extrusion for alternate protein structure modification. Cultured meat - Production and processing. 3D food printing and personalized nutrition. Application of Artificial intelligence (AI) for bioactive peptide identification in food proteins.

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR COMPUTER APPLICATIONS

Unit I

Mathematical Logic : Proposition, Logic , Truth tables, Propositional and Predicate Logic, Propositional Equivalences, Rules of Inference, Nested Quantifiers, Normal Forms

Sets and Relations : Equivalence Relations, Partially Ordering, Representation & Properties of Relations, Set Operations Counting, Mathematical Induction & Discrete Probability : Basics of Counting, Bayes' Theorem, Inclusion-Exclusion Principle, Mathematical Induction, Permutations and Combinations, Pigeonhole Principle

Group Theory : Applications of Group Theory, Automorphism, Fields, Groups, Homomorphism, Integral Domains, Isomorphism, Product and Quotients of Algebraic Structures, Rings, Semi Groups, Subgroups

Graph Theory : Bipartite Graphs, Eulerian Paths and Circuits, Graph Coloring, Hamiltonian Paths and Circuits, Multigraph, Paths and Circuits, Planner Graph, Prefix Codes, Shortest Paths in Weighted Graphs, Simple Graph, Spanning Trees and Cut-Sets, Tree Traversals, Trees and Rooted Trees, Weighted Graphs.

Unit II

Data Representation, Complements, Computer Arithmetic - Add., Sub., Mult. and Div. Algorithms, Data Types, Error Detection Codes, Fixed Point Representation, Floating Point Representation, Number Systems and Conversion

Register Transfer and Microoperations : Arithmetic, Bus and Memory Transfers, Logic and Shift Micro Operations, Register Transfer Language

Basic Computer Organisation and Design : Computer Instructions, Computer Registers, Input-Output, Interrupt, Memory-Reference Instructions, Stored Program Organisation and Instruction Codes, Timing and Control

Microprogrammed Control: Address Sequencing, Control Memory, Design of Control Unit , Addressing Modes, CISC Computer, General Register Organisation, Instruction Formats, RISC

Pipeline and Vector Processing Computer, Stack Organisation, Arithmetic Pipeline, Instruction Pipeline, Parallel Processing, Pipelining, Vector Processing Array Processors

Input-Output Organisation Asynchronous Data Transfer, DMA, Input-Output Interface, Modes of Transfer, Peripheral Devices, Priority Interrupt, Serial Communication

Memory Hierarchy Associative Memory, Auxiliary Memory, Cache Memory, Main Memory, Memory Management Hardware, Virtual Memory

Unit III

Language Design and Translation Issues: Programming Language Concepts, Paradigms and Models, Programming Environments, Virtual Computers and Binding Times, Programming Language Syntax, Stages in Translation, Formal Transition Models

Programming in C and C++ : Data Types, Identifiers, Variables, Constants and Literals, Tokens, Operators ,Sequence Control, Subprogram Control, Functions, recursive functions , Arrays, Structures, Union, String, Pointers, File Handling, Command Line Arguments, Preprocessors, Class, Object, Instantiation, Constructors and Destructors, Access specifiers, Inheritance, Encapsulation, Abstract Class, Polymorphism, , Virtual Functions, Templates, Exception and Event Handling, Streams and Files, Multi File Programs

Unit IV

Database need and evolution, Characteristics of a Database approach, Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, Centralized and Client/Server Architectures for DBMS

Entity-Relationship Diagram, Relational Model - Constraints, Languages, Design, and Programming, Relational Database Schemas, Update Operations and Dealing with Constraint Violations, Relational Algebra and Relational Calculus, Codd Rules

Data Definition and Data Types, Constraints, Queries, Insert, Delete, and Update Statements, Views, Stored Procedures and Functions, Database Triggers, SQL Injection

Functional Dependencies and Normalization, Algorithms for Query Processing and Optimization, Transaction Processing, Concurrency Control Techniques, Database Recovery Techniques, Object and Object-Relational Databases, Database Security and Authorization

Unit V

Machine, Assembly and High-Level Languages, Compilers and Interpreters, Loading, Linking and Relocation, Macros, Debuggers Operating System Structure, Operations and Services, System Calls, Operating-System Design and Implementation, System Boot

Process Scheduling and Operations, Interprocess Communication, Communication in Client–Server Systems, Process Synchronization, Critical-Section Problem, Peterson's Solution, Semaphores, Synchronization,
Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues
Scheduling Criteria and Algorithms, Thread Scheduling, Multiple Processor Scheduling, Real-Time CPU Scheduling
Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance and Detection, Recovery from Deadlock
Contiguous Memory Allocation, Swapping, Paging, Segmentation, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Mass-Storage Structure, Disk Structure, Scheduling and Management, RAID Structure, Access Methods, Directory and Disk Structure, File System Mounting, File Sharing, File-System Structure and Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery

Unit VI

Data Structures and its types, representation and implementations, Representation, Operations, implementations and Applications of Arrays, multi-dimensional arrays, Sparse Matrix, Stacks, Queues, Priority Queues, Linked Lists, Trees, Forest, Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree, B Tree, B+ Tree, B* Tree.

Data Structure for Sets, Graphs and its traversal Breadth-First Search, Depth-First Search, Shortest Paths, Maximum Flow, Minimum Spanning Trees, Sorting and Searching Algorithms, Hashing, Heap structures, String Matching Algorithms

Time and Space Complexities, Asymptotic Notation, Substitution method, Recurrence Relations, The master method, Divide and Conquer, Dynamic Programming, Greedy Algorithms, Backtracking, Branch and Bound, Comparison Trees, Lower Bounds through Reductions, P and NP Class Problems, NP-completeness and Reducibility, Randomized Algorithms

Unit VII

Software Process, Generic Process Model – Framework Activity, Task Set and Process Patterns, Process Lifecycle, Prescriptive Process Models, Project Management, Component-Based Development, Aspect-Oriented Software Development, Formal Methods, Agile Process Models – Extreme Programming (XP), Adaptive Software Development, Scrum, Dynamic System Development Model, Feature Driven Development.

Functional and Non-Functional Requirements, Eliciting Requirements, Developing Use Cases, Requirement Analysis and Modeling, Requirements Review, Software Requirement and Specification (SRS) Document.

Abstraction, Architecture, Patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Cohesion and Coupling, Object-Oriented Design, Data Design, Architectural Design, User Interface Design, Component Level Design

Software Sizing, LOC and FP based Estimations Estimating Cost and Effort, Estimation Models, Constructive Cost Model (COCOMO), Project Scheduling and Staffing, Time-line Charts

Verification and Validation, Error, Fault, Bug and Failure, Unit and Integration Testing, White-box and Black-box Testing, Basis Path Testing, Control Structure Testing, Deriving Test Cases, Alpha and Beta Testing, Regression Testing, Performance Testing, Stress Testing

McCall's Quality Factors, ISO 9126 Quality Factors, Quality Control, Quality Assurance, Risk Management, Risk Mitigation, Monitoring and Management (RMMM), Software Reliability

Change Control and Version Control, Software Reuse, Software Re-engineering, Reverse Engineering

Unit VIII

Formal Language, Non-Computational Problems, Diagonal Argument, Russell's Paradox,
Deterministic Finite Automaton (DFA), Non-Deterministic Finite Automaton (NDFA), Equivalence of DFA and NDFA, Regular Languages, Regular Grammars, Regular Expressions, Properties of Regular Language, Pumping Lemma, NonRegular Languages, Lexical Analysis

Pushdown Automaton (PDA), Non-Deterministic Pushdown, Automaton (NPDA), Context-Free Grammar, Chomsky Normal Form, Greibach Normal Form, Ambiguity,

Parse Tree Representation of Derivation Trees, Equivalence of PDA and Context-Free Grammars, Properties of Context-Free Language

Standard Turing Machine and its Variations, Universal Turing Machines, Models of Computation and Church-Turing Thesis, Recursive and Recursively Enumerable Languages, Context-Sensitive Languages, Unrestricted Grammars, Chomsky Hierarchy of Languages, Construction of TM for Simple Problems

Unsolvable Problem, Halting Problem, Post Correspondence Problem, Unsolvable Problems for Context-Free Languages, Measuring and Classifying Complexity, Tractable and Intractable Problems

Associatively, Precedence, Grammar Transformations, Top-Down Parsing, Recursive Descent Predictive Parsing, LL(1) Parsing, Bottom-up Parsing, LR Parser, LALR(1) Parser

Attribute Grammar, Syntax Directed Definitions, Inherited and Synthesized Attributes, Dependency Graph, Evaluation Order, S-attributed and L-attributed Definitions, Type-Checking

Unit IX

Components of a Data Communication System, Simplex, half-duplex and Duplex Modes of Communication, Analog and Digital Signals, Noiseless and Noisy Channels, Bandwidth, Throughput and Latency, Digital and Analog Transmission, Data Encoding and Modulation Techniques, Broadband and Baseband Transmission, Multiplexing, Transmission Media, Transmission Errors, Error Handling Mechanisms

Network Topologies, Local Area Networks, Metropolitan Area Networks, Wide Area Network, Wireless Networks, Internet, Layered Architecture, OSI Reference Model and its Protocols, TCP/IP Protocol Suite, Physical, Logical, Port and Specific Addresses, Switching Techniques

Framing, Error Detection and Correction, Flow and Error Control, Sliding Window Protocol, HDLC, Multiple Access – CSMA/CD, CSMA/CA, Reservation, Polling, Token Passing, FDMA, CDMA, TDMA, Network Devices, Backbone Networks, Virtual LANs. IPv4 Structure and Address Space, Classful and Classless Addressing, Datagram, Fragmentation and Checksum, IPv6 Packet Format, Mapping Logical to Physical Address (ARP), Direct and Indirect Network Layer Delivery, Routing Algorithms, TCP, UDP and SCTP Protocols, Flow Control, Error Control and Congestion Control in TCP and SCTP

Uniform Resource Locator (URL), Domain Name Service (DNS), Resolution - Mapping Names to Addresses and Addresses to Names, Electronic Mail Architecture, SMTP, POP and IMAP, TELNET and FTP

Unit X

Definitions , AI approach for solving problems ,Turing Test and Rational Agent Approaches, State Space Representation of Problems, Logic, Semantic Networks, Frames, Rules, Scripts, Conceptual Dependency and Ontologies, Expert Systems, Handling Uncertainty in Knowledge, Components of a Planning System, Linear and Non-Linear Planning, Goal Stack Planning, Hierarchical Planning, STRIPS, Partial Order Planning

Heuristic Search Techniques, Game Playing, Min-Max Search, Alpha Beta Cutoff Procedures

Agents and Objects, Agents and Expert Systems, Generic Structure of Multiagent System, Semantic Web, Agent Communication, Knowledge Sharing using Ontologies.

Notion of Fuzziness, Membership Functions, Fuzzification and Defuzzification, Operations on Fuzzy Sets, Fuzzy Functions and Linguistic Variables, Fuzzy Relations, Fuzzy Rules and Fuzzy Inference, Fuzzy Control System and Fuzzy Rule-Based Systems

Supervised, Unsupervised and Reinforcement Learning,

Neuron as a basic building block, activation functions, Single Perceptron, Multi-Layer Perceptron, multilayer neural network , training by Back Error propagation, Self Organizing Maps, Hopfield Network

Syllabus of Botany for Entrance Examination (Public Service Commission)

Unit-1: Microbiology, Mycology and Plant Pathology

Viruses: General Characteristics, ultrastructure and replication of TMV, CaMV and TYMV; Isolation, purification and chemical nature of TMV; modes of transmission and prevention; common viral diseases of plants; structural characteristics of bacteriophages (λ, T_4), viroids and prions.

Bacteria: General account of Eubacteria (size, shape and arrangement) and Archaebacteria (Methanogenic, halophilic and thermos-acidophilic); classification (Haeckel's three kingdom concept and Three Domain Concept of Carl Woese); Ultrastructure of cell wall and cell membrane, modes of reproduction in bacteria; salient features and importance of cyanobacteria; role of microbes in nanotechnology and bioremediation.

Fungi: Classification of fungi (Alexopolous & Mims 1979); ultrastructure and composition of fungal cell wall; nutritional types (biotrophic and symbiotic) of fungi; Heterothallism, heterokaryosis and parasexuality.

Plant Pathology: Disease symptoms, Etiology and control of important fungal diseases of crop plants (Brown spot of rice, Apple scab, Paddy blast, Powdery Mildew of cucurbits, White blister of crucifers, Downy mildew of vegetables, Tikka Disease of groundnut); Diseases caused by and disease symptoms of viroids (potato spindle tuber) and phytoplasma (Aster yellows).

Unit-2: Diversity and Evolution of Lower Plants

Algae: Range of thallus structure in algae; evolutionary trends; modes of reproduction (vegetative, asexual and sexual); major patterns of life cycles (mono-, di- and tri-genetic types); salient features of Cyanophyta, Chlorophyta, Bacillariophyta, Chrysophyta, Dinophyta, Euglenophyta, Cryptophyta, Xanthophyta, Phaeophyta and Rhodophyta; modern trends in classification of algae; structure and diversity of chloroplasts, pyrenoids and reserve storage products; algal blooms, biofertilizers and biofuels.

Bryophyta: Recent trends in classification of bryophytes; origin, evolution and alternation of generation in bryophytes; morphology, anatomy and reproduction in Marchantiales, Metzgeriales, Jungermanniales, Anthocerotales, Sphaerocarpales, Polytrichales, Funariales and Sphagnales; Bryophytes as indicators of environmental pollution, Symbiotic associations, biologically active compounds of bryophytes.

Pteridophytes: Classification of Pteridophytes (Sporne 1975); Origin and evolution of Pteridophytes; evolution of stelar types, heterospory and seed habit; Morphology, anatomy and reproduction of fossil (*Rhynia, Trimerophyton, Lepidodendron, Sphenophyllum*) and living (*Psilotum, Lycopodium, Selaginella, Isoetes, Equisetum, Osmunda, Schizaea, Pteris, Ophioglossum, Marrattia, Dryopteris, Ceratopteris, Platyzoma, Asplenium, Acrostichum, Marsilea* and *Salvinia*) pteridophytes; role as biofertilizers; economic and ecological importance of pteridophytes.

Gymnosperms: Distribution of living gymnosperms in J&K; origin, evolution and classification (Sporne 1965) of gymnosperms; morphology, anatomy and reproduction in *Cycadeoida, Cordaites, Cycas, Ginkgo, Pinus, Ephedera, Welwitschia* and *Gnetum*.

Unit-3: Taxonomy and Systematics of Angiosperms

Classification: Systems of classification-Artificial (Carl Linnaeus), Natural (Bentham and Hooker) and Phylogenetic (Takhtajan) systems; concept and principles of phenetics and cladistics.

Taxonomic tools: Taxonomic categories and hierarchy; species concept; keys, field and herbarium techniques; methods of plant identification (literature, e-floras, manuals, icons, journals etc.).

Nomenclature: ICN, principles of plant nomenclature, names of taxa, type method, author citation, principles of priority; Basionyms, Synonyms, Homonyms, Autonyms and Tautonyms.

Family description: Taxonomic description of Ranunculaceae, Fabaceae, Malvaceae, Asteraceae, Solanaceae, Poaceae, Liliaceae, Orchidaceae, Zingiberaceae.

Concept and utility of APG-IV classification; Parsimony, Maximum likelihood, and DNA barcoding in phylogenetic analysis.

Unit-4: Cytology, Genetics and Cytogenetics

Chromatin organization and gene structure: Organization of chromosomes-nucleosome, centromere and telomere; euchromatin and heterochromatin; Operon, unique and repetitive DNA, Concept of gene, allele, multiple alleles, pseudoalleles, interrupted genes, gene families; complementation tests; mitochondrial and chloroplast genomes.

Genetic recombination and Gene mapping: Linkage and independent assortment, crossing over, linkage maps, tetrad analysis, mapping with molecular markers,

mapping by using somatic cell hybrids, development of mapping population in plants; Genetic transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating.

Mutations: Spontaneous and induced mutations; Types, causes and detection; mutant types – lethal, conditional, biochemical, loss of function, gain of function; germinal versus somatic mutants; insertional mutagenesis; transposable elements in eukaryotes (Ac-Ds, P and Ty elements) and prokaryotes (IS, Tn3 and Tn10).

Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation; Euploidy (auto and allo-polyploidy) and aneuploidy (monosomics and trisomics) and their genetic implications.

Unit-5: Cell and Molecular Biology

Plant cell envelope, structure and function: Structure, function and biogenesis of primary and secondary cell wall in plants; plasma membrane-chemical composition, organization of various components, fluid-mosaic model, lipid rafts; plasma membrane and cellular details of transport-carriers, pumps and channels; mechanism of sorting and regulation of intracellular transport, electrical properties of membranes; a general concept of cell division (Mitosis and meiosis) and cell cycle regulation

Structural organization and function of intracellular organelles: Structure and functions of Nucleus, Mitochondria, Golgi bodies, Lysosomes, Endoplasmic reticulum, Peroxisomes, Plastids, Vacuoles; structure & function of Cytoskeleton and its role in motility.

DNA structure, replication and repair: DNA structure-A, B, Z Types; mechanism of replication in prokaryotes and eukaryotes, enzymology and fidelity of replication; DNA damage and repair mechanisms

RNA synthesis and processing: Transcription factors, machinery and mechanism in prokaryotes and eukaryotes; formation of initiation complex, transcription activators and repressors, RNA capping, polyadenylation, splicing and editing; structure and function of different types of RNA, mRNA transport.

Protein synthesis and processing: Ribosome, charging of tRNA, Mechanism of translation in prokaryotes and eukaryotes, factors involved there in; genetic code, translational proof-reading, translational inhibitors, post-translational modification of proteins.

Regulation of gene expression: Control at transcription and translation level in prokaryotes (lac and trp operons) and eukaryotes (hormonal control and methylation)

Unit-6: Physiology and Metabolism

Biomolecules, Enzymes and Bioenergetics: Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins); Enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes; Glycolysis, oxidative phosphorylation.

Photosynthesis and Respiration: Light harvesting complexes; mechanisms of electron transport; photo-protective mechanisms; CO_2 fixation-C_3, C_4 and CAM pathways; Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiration.

Nitrogen metabolism and Plant hormones: Nitrate and ammonium assimilation; amino acid biosynthesis; Plant Hormones-Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action.

Transport, photobiology and stress physiology: Uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photo-assimilates; Structure, function and mechanisms of action of phytochromes, cryptochromes; stomatal movement; photoperiodism and biological clocks; Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses.

Unit-7: Plant Anatomy, Reproduction and Economic Botany

Plant Tissues & Organs: Primary structure and basic vasculature of Root, Leaf and Shoot; Origin and diversity of epidermis, stomata and trichomes; Meristems-types, composition and structure; function of RAM and SAM; organization and function of vascular cambium, Structure and function of primary and secondary Xylem and Phloem, Anatomy of root, stem and leaf in monocots and dicots.

Plant Reproduction: Types of reproduction, transition to flowering (Autonomous, photoperiodic and vernalization pathways); flower development, microsporogenesis and micro-gametogenesis; megasporogenesis and mega-gametogenesis; pollination types and syndromes, pollen-pistil interaction, male sterility and self incompatibility, fruit and seed dispersal mechanisms; Embryo & Endosperm development (brief account).

Plant Resource Utilization: Origin of Crop Plants (primary and secondary centres); gene pool and germplasm concept; Origin and uses of Food (maize, buckwheat), Fibre (cotton, jute), Spices (saffron, ginger), Oil (groundnut, mustard), Sugar (beetroot), beverage (tea) yielding plants, bamboos and rubber.

Plant Resource Conservation: Biodiversity extinction, types and causes; IUCN categories of plants; objectives and principles of conservation and resource management – In-situ and ex-situ conservation strategies; Legislation and enactments on conservation; concept of IPR.

Unit-8: Ecology and Environment

Environment, Habitat and Niche: Physical environment; biotic environment; biotic and abiotic interactions; Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.

Ecosystem Ecology: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C, N, P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine).

Species and Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of metapopulation – demes and dispersal, interdemic extinctions; Types of species interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis

Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones; Ecological succession - types; mechanisms; changes involved in succession; concept of climax.

Applied Ecology: Environmental pollution; global environmental change; biodiversity: status, monitoring and documentation; major drivers of biodiversity change (Climate change, green house gases, carbon dioxide fertilization and sequestration); biodiversity management approaches; Concepts and utility of Ecological Niche Modeling, RS and GIS.

Unit-9: Tissue Culture and Genetic Engineering of Plants

Plant tissue culture and organogenesis: Concept of cell differentiation and totipotency, single cell culture, techniques involved in and factors affecting single cell isolation; processes and factors affecting organogenesis, somatic embryogenesis.

Micropropagation and Somatic hybridization: Concept and techniques of micropropagation-factors involved, applications and limitations; Protoplast isolation, culture and regeneration, somatic hybridization and selection; Utility of hybrids, cybrids and haploids.

Recombinant DNA technology: Principles and techniques of gene cloning, restriction enzymes-characteristics and utility; Use of Vectors (plasmids,

phages, phagemids and cosmids), artificial chromosomes (YAC); genomic and cDNA libraries, polymerase chain reaction (PCR) – principle, techniques and applications.

Genetic engineering of plants: Agrobacterium mediated and direct methods of gene transfer (electroporation and biolistic); applications of transgenic plants; biosafety - possible ecological risks and ethical concerns of GM crops; Genomics and proteomics-concept and applications, DNA microarrays, gene silencing mechanisms (RNAi), genome editing (CRISPR-Cas).

Unit-10: Biotechniques and Biostatistics

Microscopic techniques: Visualization of cells and sub-cellular components by light microscopy; Microscopy of living cells, Principles and applications of Fluorescence and phase contrast microscopy; Scanning and Transmission Electron Microscopy

Isolation, detection and sequencing of macromolecules: Isolation, separation and analysis of RNA, DNA, Proteins, carbohydrate and lipid molecules; Gel Electrophoresis (AGE & PAGE and SDS-PAGE); DNA and protein sequencing methods, techniques and applications of RFLP, RAPD, AFLP, FISH and GISH.

Spectroscopy and Chromatography: Molecular analysis using UV/visible, fluorescence, NMR and ESR, Atomic Absorption and Atomic Emission spectroscopy; Chromatography techniques; Gas chromatography, Thin Layer Chromatography, HPLC and Mass Spectroscopy.

Biostatistics: Measures of central tendency and dispersion; Skewness, Kurtosis; methods of sampling (random and non random); probability distributions (Binomial, Poisson and normal); Sampling distribution; Difference between parametric and non-parametric statistics; Confidence Interval; Errors; Levels of significance; Regression and Correlation; t-test; Analysis of variance; χ^2 test; Basic introduction to Multivariate statistics.

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR CHEMISTRY

Unit-1

- Chemical Periodicity, Periodic trends in properties of elements, electron gain enthalpy, valence and oxidation states.
- Structure and bonding in homo – and hetero-nuclear molecules, Lattice energy, Born Haber Cycle, Fajan's Rules and its applications. VSEPR theory – shapes and structures of molecules.
- Acid & Bases, Hard and Soft Acid Base, non-aqueous solvents.
- Main group elements and their compounds, synthesis, structure and Bonding.
  Industrial Applications of compounds.

Unit-2

- Transition elements & co-ordination compounds: Structure, Bonding theories, Spectral & magnetic properties.
- Inner Transition elements: Spectral and magnetic properties, redox chemistry and analytical applications.
- Organometallic compounds: Synthesis, Bonding and structure, Organometallics in homogeneous catalysis.
- Cages and Metal Clusters: Bonding in di- and tri-nuclear metal clusters, and hetereopolymellates.

Unit-3

Analytical Chemistry:- Spectroscopic [X-Ray photoelectron spectroscopy, Scanning Electron microscopy (SEM), Transmission Electron Microscopy (TEM)], Electron thermoanalytical methods,

Thermogravimetry (TG), Differential Thermal analysis (DTA) and Differential Scanning Calorimetry (DSC)

Bioinorganic Chemistry: Photosystems, porphyrins, metalloenzymes containing Zinc and copper, oxygen, Transport, electron transfer reactions, metal complexes in medicines (vanadium & platinum based) .

Characterisation of Inorganic compounds by IR, Raman, NMR, EPR, Mossbauer, UV-VIS, MS, electron spectroscopy & microscopic techniques.

Nuclear Chemistry: Nuclear reactions (fission & fusion), radioanalytical techniques and activation analysis.

Unit-4

- Basic principles of Quantum mechanics : Postulates, operator algebra exactly solvable systems: particle-in-a-box, harmonic oscillator and the hydrogen atom, including shapes of atomic orbitals, orbital and spin angular moments, tunnelling.
- Approximate methods of quantum mechanics: Variational principle, perturbation theory up to second order in energy, applications.
- Atomic structure and spectroscopy: Term symbols, many-electron systems and antisymmetry principle.
- Chemical bonding in diatomics: Elementary concepts of MO and VB theories: Huckel theory for conjugated Π-electron systems.
- Chemical applications of group theory: symmetry elements, point groups, character tables, selection rules. Applications of group theory in IR and Raman Spectroscopy.

Unit-5

- Molecular Spectroscopy: Rotational and vibrational spectra of diatomic molecules, electronic spectra, IR and Raman activites - selection rules, basic principles of magnetic resonance.
- Chemical thermodynamics: Laws, state and path functions and their application, thermodynamic description of various types of processes, Maxwell's relations, spontaneity and equilibria, temperature and pressure dependence of thermodynamic quanities, Le Chatelier principle, elementary description of phase transitions, phase equilibria and phase rule, thermodynamics of ideal and non-ideal gases and solutions.
- Statistical thermodynamics: Boltzmam distribution, Kinetic theory of gases, partition functions and their relation to thermodynamic quantities – calculations for model systems.
- Electrochemistry: Nernst equation, redox systems, electrochemical cells, Debye-Huckel theory, electrolytic conductance - Kohlrausch's law and its applications, ionic equilibria, conductmetric and potentiometric titrations.

Unit-6

- Chemical Kinetics: Empirical rate laws and temperature dependence, complex reaction, steady state approximation, determination of reaction mechanisms, collision and transition state theories of rate constant, unimolecular reaction, salt effects and homogeneous catalysis.

- Colloids and Surfaces: Stability and properties of colloids, isotherms and surface area, heterogeneous catalysis.
- Solid State: Crystal structure, Crystal defects and their types, Bragg's equation and applications, electron energy bands.
- Polymer chemistry: Characterization of polymers, Thermodynamics of solutions of high polymers, Molar mass and Kinetics of polymerization.

Unit-7

- IUPAC nomenclature of organic molecules including regio-and stereo-isomers.
- Principles of stereochemistry: Configurational and conformational isomerism in acyclic and cyclic compounds, stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction.
- Aromaticity: Benzenoid and non-benzenoid compounds, generation and reactions, Anti-aromaticity and homo-aromaticity.
- Organic reactive intermediates: Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzynes and nitrenes.

Unit-8

- Organic reaction mechanisms involving additions, elimination and substitution reactions with electrophilic , nucleophilic and radical species. Determination of reaction pathways.
- Name Reactions and rearrangements: Aldol, Knoevenaegel, Robinson annulation, Claisen

condensation, Wittig, Wagner-Meerwein, Pinacol, Fevorskii, Hoffman, Schmidt, Beckmann, Baeyer Villiger.

- Oxidation and Reduction, Organic Transformations and Reagents: Functional group inter-conversion, functional group protection, synthons and synthetic equivalents, One group and two group disconnection, Umpolung reactivity.

Unit-9

- Pericyclic reactions: electrocyclisation, cycloadditions, sigmatropic rearrangements and group transfer reaction, Principles and applications of photochemical reactions in organic chemistry.
- Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (N, S).
- Chemistry of Natural products: Carbohydrates, proteins, fatty acids, nucleic acids and terpenes.
- Structure determination of organic compounds by IR, UV-Vis, ^{1}H, ^{13}C NMR and Mass spectrometry techniques.

Unit-10

- Green Chemistry: Designing green chemical synthesis, green solvents, green catalysts, supercritical fluids, Phase transfer calatysts.
- Supramolecular Chemistry: Types and nature of Supramolecular Non-covalent interactions, crystal engineering of organic molecules and Inorganic molecules, Polymorphism, Metal Organic frameworks (MOFs), Chemistry in nanoscience and Technology.

SYLLABUS

BBA/MBA

Subject : Management

Unit – I

Management – Concept, Process, Theories and Approaches, Management Roles and Skills; Functions – Planning, Organizing, Staffing, Coordinating and Controlling; Communication – Types, Process and Barriers; Decision Making – Concept, Process, Techniques and Tools; Organisation Structure and Design – Types, Authority, Responsibility, Centralisation, Decentralisation and Span of Control;

Managerial Economics – Concept & Importance; Demand analysis – Utility Analysis, Indifference Curve, Elasticity& Forecasting ; Market Structures – Market Classification & Price Determination ; Inflation – Concept; types and Measurement; Business Ethics & CSR, Ethical Issues & Dilemma; Corporate Governance.

Unit – II

Organisational Behaviour – Significance & Theories ; Individual Behaviour – Personality, Perception, Values, Attitude, Learning and Motivation theories ; Group Behaviour – Team Building, Leadership, Group Dynamics ; Interpersonal Behaviour & Transactional Analysis ; Organizational Culture & Climate ; Emotions and Stress Management.

Human Resource Management – Concept, Perspectives, Influences and Recent Trends; Human Resource Planning, Recruitment and Selection, Induction, Training and Development ; Job Analysis, Job Evaluation and Compensation Management .

Unit – III

Strategic Role of Human Resource Management ; Competency Mapping & Balanced Scoreboard ; Career Planning and Development ; Performance Management and Appraisal ; Organization Development, Change & OD Interventions; Employee Engagement & Work Life Balance

Industrial Relations: Disputes & Grievance Management, Labour Welfare and Social Security; Trade Union & Collective Bargaining; International Human Resource Management – HR Challenge of International Business

Unit– IV

Accounting Principles and Standards, Preparation of Financial Statements ; Financial Statement Analysis – Ratio Analysis, Funds Flow and Cash Flow Analysis, DuPont Analysis ; Preparation of Cost Sheet, Marginal Costing, Cost Volume Profit Analysis ; Standard Costing & Variance Analysis.

Financial Management, Concept & Functions; Capital Structure – Theories, Cost of Capital, Sources and Finance; Budgeting and Budgetary Control, Types and Process, Zero base Budgeting ; Leverages – Operating, Financial and Combined Leverages, EBIT–EPS Analysis, Financial Breakeven Point & Indifference Level.

Unit –V

Valuation of Bonds and Shares, Risk and Returns; Capital Budgeting – Nature of Investment, Evaluation, Comparison of Methods; Risk and Uncertainly Analysis ; Dividend – Theories and Determination; Working Capital Management – Determinants, Cash, Inventory, Receivables and Payables Management, Factoring.

Mergers and Acquisition – Corporate Restructuring, Value Creation, Merger Negotiations, Leveraged Buyouts, Takeover ; Portfolio Management – CAPM, APT; Derivatives – Options, Option Payoffs, Option Pricing, Forward Contracts & Future Contracts.

Unit - VI

Strategic Management – Concept, Process, Decision & Types; Strategic Analysis – External Analysis, PEST, Porter's Approach to industry analysis, Internal Analysis – Resource Based Approach, Value Chain Analysis

Strategy Formulation – SWOT Analysis, Corporate Strategy – Growth, Stability, Retrenchment, Integration and Diversification, Business Portfolio Analysis - BCG, GE Business Model, Ansoff's Product Market Growth Matrix; Strategy Implementation – Challenges of Change, Developing Programs Mckinsey 7s Framework

Marketing – Concept, Orientation, Trends and Tasks, Customer Value and Satisfaction ; Market Segmentation, Positioning and Targeting; Product and Pricing Decision – Product Mix, Product Life Cycle, New Product development, Pricing – Types and Strategies; Place and promotion decision – Marketing channels and value networks, VMS, IMC, Advertising and Sales promotion

Unit –VII

Consumer and Industrial Buying Behaviour: Theories and Models of Consumer Behaviour; Brand Management – Role of Brands, Brand Equity, Brand Extension; Designing and Managing Sales Force.

Service Marketing – Managing Service Quality and Brands, Marketing Strategies of Service Firms; Customer Relationship Marketing – Relationship Building, Strategies, Values and Process; Retail Marketing – Recent Trends in India, Types of Retail Outlets. Concept of e-Marketing and Digital Marketing.

Unit –VIII

Statistics for Management: Concept, Measures Of Central Tendency and Dispersion, Probability Distribution – Binominal, Poison and Normal; Data Collection & Questionnaire Design ; Sampling – Concept, Process and Techniques ; Hypothesis Testing – Procedure; T, Z, F, Chi-square tests ; Correlation and Regression Analysis

Operations Management – Role and Scope; Facility Location and Layout – Site Selection and Analysis; Layout – Design and Process; Inventory control techniques.

Production planning and control- Scheduling, Loading, Sequencing and Monitoring; Quality Management and Statistical Quality Control, Quality Circles, Total Quality Management; Logistics and Supply Chain Management, Value creation, Supply Chain Design.

Unit –IX

Operation Research – Linear Programming- formulations and solutions; Transportation and assignment optimisation techniques, Queuing theory, games theory and Decision theory; PERT / CPM - Networking analysis and solutions.

Information Technology – Use of Computers in Management Applications; MIS, DSS; Artificial Intelligence and Big Data; Data Warehousing, Data Mining and Knowledge Management – Concepts.

Unit – X

Entrepreneurship Development – Concept, Types, Theories and Process, Developing Entrepreneurial Competencies; Entrepreneurship – Concept and Process; Women Entrepreneurship and Rural Entrepreneurship; Innovations in Business – Types of Innovations, Creating and Identifying Opportunities, Screening of Business Ideas.

Business Plan and Feasibility Analysis – Concept and Process of Technical, Market and Financial Analysis; Micro and Small Scale Industries in India; Role of Government in Promoting SSI; Sickness in Small Industries – Reasons and Rehabilitation.

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR PHILOSOPHY

1. Western Metaphysics and Epistemology

a) Theories of Reality (Realism, Idealism, Materialism)
b) Theories of Knowledge (Rationalism, Empiricism, Scepticism)
c) Theories of Truth (Correspondence, Coherence, Pragmatic)
d) Theories of Substance (Descartes, Spinoza, Leibniz)
e) Theories of Perception (Locke, Berkeley, Hume)

2. Indian Metaphysics and Epistemology

a) Concept of Reality (Advaita Vedanta, Samkhya, Vaisheshika)
b) Concept of Self (Nyaya, Samkhya, Advaita Vedanta)
c) Concept of Causation (Satkaryavada, Asatkaryavada, Pratityasamutpada)
d) Concept of Pramanas (Pratyaksha, Anumana, Upamana, Shabda, Arthapatti, Anupalabdhi)
e) Concept of Universals (Nyaya, Buddhism)

3. Western Political Thought

a) Theories of Liberty (Negative, Positive)
b) Theories of Justice (Rawls, Nozick)
c) Theories of Social Contract (Hobbes, Locke, Rousseau)
d) Political Ideologies (Nationalism, Secularism, Communism)
e) Contemporary Debates (Inclusive Development, Feminism)

4. Indian Political Thought

a) Modernity (Gandhi, Nehru)
b) Humanism (M.N. Roy, Deen Dayal Upadhyaya)
c) Social Justice (Ambedkar, Ram Manohar Lohia)
d) Nationalism (Sri Aurobindo, Tagore)
e) Reformism (Pandita Ramabai, Periyar)

5. Western Ethics

a) Cardinal Virtues (Plato)
b) Virtue Ethics (Aristotle)
c) Deontological Ethics (Kant)
d) Utilitarianism (Bentham, Mill)
e) Emotivism (A.J. Ayer)

6. Indian Ethics

a) Vedic Conceptions (Rta, Rna, Karma)
b) Jaina Ethics (Triratnas, Mahavratas)
c) Buddhist Ethics (Silas, Brahmaviharas)
d) Ethics of the Gita (Lokasamgraha, Nishkama Karma)
e) Charvaka (Hedonism)

7. Applied Ethics

a) Branches of Applied Ethics
b) Environmental Ethics (Animal Rights, Rights of Future Generations)
c) Medical Ethics (Euthanasia, Cloning, Abortion)
d) Business and Media Ethics
e) Theories of Punishment (Retributive, Deterrent, Reformative)

8. Philosophy of Religion

a) Theories of God (Monotheism, Polytheism, Pantheism, Deism, Atheism)
b) Characteristics of God (Omnipotence, Omniscience, Omnibenevolence)
c) Arguments for the Existence of God (Ontological, Cosmological, Teleological, Moral)
d) Arguments against the Existence of God (Freud, Marx, Durkheim)
e) Problem of Evil (St. Augustine, Leibniz)

9. Propositional Logic

a) Propositions (Simple, Compound), Categorical Propositions (Quality, Quantity, Distribution)
b) Arguments (Deductive, Inductive), Validity and Invalidity, Strength and Weakness
c) Categorical Syllogism (Middle Term, Minor Term, Major Term)
d) Truth Functions (Negation, Conjunction, Disjunction, Implication, Equivalence), Truth Tables
e) Laws of Thought, Square of Opposition

10. Philosophical Thought of Kashmir

a) Lal Ded, Abhinavagupta
b) Mir Sayyed Ali Hamadani, Shaikh-ul Alam
c) Swatantrayavada and Abhasavada
d) Laksyas, Malas and Upayas
e) Maya, Kanchuk, Tatvas

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR ECONOMICS

I. Microeconomics.

1. Indifference curve analysis
2. Revealed preference (weak & strong axioms)
3. Cobb-Douglas production function
4. Market structures & equilibrium in Perfect competition, Monopoly, Monopolistic Competition & Oligopoly.
5. Prisoners Dilemma, Nash Equilibrium
6. Pareto optimality & theorems of welfare economics

II. Macroeconomics.

1. Consumption Function- Life cycle and Permanent Income theory of consumption
2. Quantitative theory of money - Fisher and Cambridge Approaches
3. Keynes Liquidity Preference Approach.
4. Theories of trade cycle- Kaldor, Hicks & Samuelson.
5. Neoclassical IS-LM Model
6. Mundell – Fleming Model
7. Theory of rational expectation
8. Lucas imperfect information model.

III. Economy of Development

1. Concept & Measurement of Poverty.
2. Concept of Inequality; Measure of Inequality – Lorenz curve & FGT Indices.
3. Idea & Measurement of Development Gap.
4. Lewis Model of Unlimited Supplies of Labor.
5. Organizational Dualism and Economic Development.
6. Complementarities between Industry and Agriculture.
7. Market & Market failure
8. State & State failure.

IV. Economics of Growth.

1. Harrod & Domar Models
2. Neoclassical Growth Models of Solow Meade & Joan Robinson
3. Romer Model
4. Two sector Model of Ujawa
5. A-K model

V. International Economics

1. Heckscher- Ohlin Theory
2. Factor Price Equalization Theorem
3. Stopler- Samuelson Theorem
4. Tariff – General equilibrium analysis
5. Theory of Customs Union- trade creation & trade diversion.
6. Balance of Payments – meaning and components.
7. Adjustment under flexible & fixed Exchange Rate.

VI. Public Economics

1. Role of government – allocation, distribution & stabilization
2. Wagner's theory of public expenditure
3. Taxation- types & Tax incidence
4. Theory of Optimal taxation.
5. Concepts & Evolution of Fiscal- Federalism in India.
6. Centre – State financial relations - Vertical & horizontal imbalances.

VII. Indian Economy

1. Economic Growth since independence- Pattern and Structure.
2. Agricultural Growth – Pattern and Structure, major challenges and Policy response.
3. Industrial Growth- Pattern and Structure
4. Industrial policies of 1956 & 1991.
5. Poverty, Inequality and Employment in India- extent, incidence and trends.
6. Economic Reforms - reasons, rationale & policy measure.

VIII. Monetary Economics

1. Money Supply & components of Money Supply.
2. Money Multiplier and its determinants.
3. Role & Functions of Central Banks.
4. Commercial Banks & Credit Creation.
5. Theories of Interest Rate- Classical, Loanable Fund and Neo-Keynesian.
6. The term structure theories of interest rates- expectation theory and market segmentation theory.

IX. Financial Institutions & Markets.

1. Structure & Role of Financial System .
2. Financial Markets- Functions and Instruments.
3. Financial Intermediaries – Classification, Role & Functions.
4. Financial Services – Classification, Merchant Banking, Underwriting, Credit Rating , Venture Capital.
5. Working & Functioning of National Stock Exchange, Bombay Stock Exchange and Securities & Exchange Board of India.

X. Quantitative Techniques in Economies

1. Descriptive Statistics- Measures Of Central Tendency and Dispersion.
2. Correlation – Karl Pearson's Coefficient of Correlation
3. Index Numbers- Fisher's & Paasche's
4. Sampling Methods – Probability & Non-Probability.
5. Set Operations- Additions, Subtractions, Multiplication & Union.
6. Linear and Non-Linear Functions in Economics.

SYLLABUS

UNIT 1: Educational Studies

a) Contribution of Indian Schools of philosophy (Sankhya Yoga, Vedanta, Buddhism, Jainism) with special reference to Vidya, Dayanand Darshan; and Islamic traditions towards educational aims and methods of acquiring valid knowledge

b) Contribution of Western schools of thoughts (Idealism, Realism, Naturalism, Pragmatism, Marxism, Existentialism) and their contribution to Education with special reference to information, knowledge and wisdom

c) Approaches to Sociology of Education (symbolic Interaction, Functionalism Emil Darkheim's and Conflict Theory). Concept and types of social Institutions and their functions (family, school and society), Concept of Social Movements, Theories of Social Movements (Relative Deprivation, Resource Mobilization, Political Process Theory)

d) Socialization and education- education and culture; Contribution of thinkers (Swami Vivekananda, Rabindranath Tagore, Mahatma Gandhi, Aurobindo, J.Krishnamurthy, Paulo Freire, and Savitribai Phule) to the development of educational thought for social change, National Values as enshrined in the Indian Constitution - Socialism, Secularism, justice, liberty, democracy, equality, freedom with special reference to education.

UNIT 2: History, Politics and Economics of Education

a) Committees and Commissions' Contribution to Teacher Education Secondary Education Commission (1953), Kothari Education Commission (1964-66), National Policy of Education (1986,1992), National Commission on Teachers (1999), National Curriculum Framework 2005, National Knowledge Commission (2007), Yashpal Committee Report (2009), National Curriculum (1985) Framework for Teacher

Education (2009), Justice Verma Committee Report (2012), NEP (2020)

b) Relationship between Policies and Education, Linkage between Educational Policy and National Development, Determinants of Educational Policy and Process of Policy formulation: Analysis of the existing situation, generation of policy options, evaluation of policy options, making the policy decision, planning of policy implementation, policy impact assessment and subsequent policy cycles.

c) Concept of Economics of Education: Cost Benefit Analysis Vs Cost Effective Analysis in Education, Economic returns to Higher Education Signaling Theory Vs Human Capital Theory, Concept of Educational Finance; Educational finance at Micro and Macro Levels, Concept of Budgeting

d) Relationship Between Politics and Education, Perspectives of Politics of Education Liberal, Conservative and Critical, Approaches to understanding Politics (Behaviouralism, Theory of Systems Analysis and Theory of Rational Choice), Education for Political Development and Political Socialization

UNIT 3: Learner and Learning Process

a) Growth and Development: Concept and principles ,Cognitive Processes and stages of Cognitive Development , Personality: Definitions and theories (Freud, Carl Rogers, Gordon Allport, Max Wertheimer, Kurt Koffka) , Mental health and Mental hygiene

b) Approaches to Intelligence from Unitary to Multiple: Concepts of Social intelligence, multiple intelligence, emotional intelligence Theories of Intelligence by Sternberg, Guilford'S Structure of Intellect, Gardner, Assessment of Intelligence, Concepts of Problem Solving, Critical thinking, Metacognition and Creativity

c) Principles and Theories of learning: Behaviouristic, Cognitive and Social theories of learning, Factors affecting social learning, social competence, Concept of social cognition,

understanding social relationship and socialization goals

d) Guidance and Counselling: Nature, Principles and Need, Types of guidance (educational, vocational, personal, health and social & Directive, Non-directive and Eclectic), Approaches to counselling – Cognitive-Behavioural (Albert Ellis – REBT) & Humanistic, Person- centred Counselling (Carl Rogers) - Theories of Counselling (Behaviouristic, Rational, Emotive and Reality)

UNIT 4: Teacher Education

a) Meaning, Nature and Scope of Teacher Education; Types of Teacher Education Programs, The Structure of Teacher Education Curriculum and its Vision in Curriculum Documents of NCERT and NCTE at Elementary, Secondary and Higher Secondary Levels , Organization of Components of Pre-service Teacher Education Transactional Approaches (for foundation courses) Expository, Collaborative and Experiential learning

b) Understanding Knowledge base of Teacher Education from the view point of Schulman, Meaning of Reflective Teaching and Strategies for Promoting Reflective Teaching, Models of Teacher Education - Behaviouristic, Competency-based and Inquiry Oriented Teacher Education Models

c) Concept, Need, Purpose and Scope of In-service Teacher Education, Organization and Modes of In-service Teacher Education, Agencies and Institutions of In-service Teacher Education at District, State and National Levels (SSA, RMSA, SCERT, NCERT, NCTE and UGC), Preliminary Consideration in Planning in-service teacher education programme (Purpose, Duration, Resources and Budget)

d) Concept of Profession and Professionalism, Teaching as a Profession, Professional Ethics of Teachers, Personal and Contextual factors affecting Teacher Development, ICT Integration, Quality Enhancement for Professionalization of Teacher Education, Innovation in Teacher Education.

UNIT 5: Curriculum Studies

a) Concept and Principles of Curriculum, Strategies of Curriculum Development, Stages in the Process of Curriculum development, Foundations of Curriculum Planning - Philosophical Bases (National, democratic), Sociological basis (socio cultural reconstruction), Psychological Bases (learner's needs and interests),Bench marking and Role of National level Statutory Bodies - UGC, NCTE and University in Curriculum Development

b) Models of Curriculum Design: Traditional and Contemporary Models (Academic / Discipline Based Model, Competency Based Model, Social Functions / Activities Model [social reconstruction], Individual Needs & Interests Model, Outcome Based Integrative Model , Intervention Model, C I P P Model (Context, Input, Process, Product Model)

c) Instructional System, Instructional Media, Instructional Techniques and Material in enhancing curriculum Transaction, Approaches to Evaluation of Curriculum : Approaches to Curriculum and Instruction (Academic and Competency Based Approaches), Models of Curriculum Evaluation: Tyler's Model, Stakes' Model, Scriven's Model,
Kirkpatrick's Model

d) Meaning and types of Curriculum change, Factors affecting curriculum change, Approaches to curriculum change, Role of students, teachers and educational administrators in curriculum change and improvement, Scope of curriculum research and Types of Research in Curriculum Studies

UNIT 6: Research in Education

a) Meaning and Scope of Educational Research, Meaning and steps of Scientific Method, Characteristics of Scientific Method (Replicability, Precision, Falsifiability and Parsimony), Types of Scientific Method (Exploratory, Explanatory and Descriptive), Aims of research as a scientific activity: Problem-solving, Theory Building and Prediction, Types of research (Fundamental, Applied and Action), Approaches to educational research (Quantitative and Qualitative), Designs in educational research (Descriptive, Experimental and

Historical)

b) Variables: Meaning of Concepts, Constructs and Variables, Types of Variables (Independent, Dependent, Extraneous, Intervening and Moderator), Hypotheses - Concept, Sources, Types (Research, Directional, Non-directional, Null), Formulating Hypothesis, Characteristics of a good hypothesis, Steps of Writing a Research Proposal, Concept of Universe and Sample, Characteristics of a good Sample, Techniques of Sampling (Probability and Non-probability Sampling), Tools of Research - Validity, Reliability and Standardisation of a Tool, Types of Tools (Rating scale, Attitude scale, Questionnaire, Aptitude test and Achievement Test, Inventory), Techniques of Research (Observation, Interview and Projective Techniques)

c) Types of Measurement Scale (Nominal, Ordinal, Interval and Ratio), Quantitative Data Analysis - Descriptive data analysis (Measures of central tendency, variability, fiduciary limits and graphical presentation of data), Testing of Hypothesis (Type I and Type II Errors), Levels of Significance, Power of a statistical test and effect size, Parametric Techniques, Non-Parametric Techniques , Conditions to be satisfied for using parametric techniques, Inferential data analysis, Use and Interpretation of statistical techniques: Correlation, t-test, z-test, ANOVA, chi-square (Equal Probability and Normal Probability Hypothesis). Qualitative Data Analysis - Data Reduction and Classification, Analytical Induction and Constant Comparison, Concept of Triangulation

d) Qualitative Research Designs: Grounded Theory Designs (Types, characteristics, designs, Steps in conducting a GT research, Strengths and Weakness of GT) - Narrative Research Designs (Meaning and key Characteristics, Steps in conducting NR design), Case Study (Meaning, Characteristics, Components of a CS design, Types of CS design, Steps of conducting a CS research, Strengths and weaknesses), Ethnography (Meaning, Characteristics, Underlying assumptions, Steps of conducting ethnographic research, Writing ethnographic account, Strengths and weaknesses),

Mixed Method Designs: Characteristics, Types of MM designs (Triangulation, explanatory and exploratory designs), Steps in conducting a MM designs, Strengths and weakness of MM research.

UNIT 7: Technology in/ for Education

a) Concept of Educational Technology (ET) as a Discipline: (Information Technology, Communication Technology & Information and Communication Technology (ICT) and Instructional Technology, Applications of Educational Technology in formal, non formal (Open and Distance Learning), informal and inclusive education systems, Overview of Behaviourist, Cognitive and Constructivist Theories and their implications to Instructional Design (Skinner, Piaget, Ausubel, Bruner, Vygotsky), Relationship between Learning Theories and Instructional Strategies (for large and small groups, formal and non formal groups)

b) Systems Approach to Instructional Design, Models of Development of Instructional Design (ADDIE, ASSURE, Dick and Carey Model Mason's), Gagne's Nine Events of Instruction and Five E's of Constructivism, Nine Elements of Constructivist Instructional Design, Application of Computers in Education: CAI, CAL, CBT, CML, Concept, Process of preparing ODLM, Concept of e learning, Approaches to e learning (Offline, Online, Synchronous, Asynchronous, Blended learning, mobile learning)

c) Emerging Trends in e learning: Social learning (concept , use of web
2.0 tools for learning, social networking sites, blogs, chats, video conferencing, discussion forum), Open Education Resources (Creative Common, Massive Open Online Courses; Concept and application), SWAYAM E Inclusion - Concept of E Inclusion, Application of Assistive technology in E learning , Quality of E Learning – Measuring quality of system: Information, System, Service, User Satisfaction and Net Benefits (D&M IS Success Model, 2003), Ethical Issues for E Learner and E Teacher -

Teaching, Learning and Research

d) Use of ICT in Evaluation, Administration and Research: E portfolios, ICT for Research - Online Repositories and Online Libraries, Online and Offline assessment tools (Online survey tools or test generators) – Concept and Development.

UNIT 8: Educational Management, Administration and Leadership

a) Leadership in Educational Administration: Meaning and Nature, Approaches to leadership: Trait, Transformational, Transactional, Value based, Cultural, Psychodynamic and Charismatic, Models of Leadership (Blake and Mouton's Managerial Grid, Fiedler's Contingency Model, Tri-dimensional Model, Hersey and Blanchard's Model, Leader-Member Exchange Theory)

b) Concept of Quality and Quality in Education: Indian and International perspective, Evolution of Quality: Inspection, Quality Control, Quality Assurance, Total Quality Management (TQM), Six sigma, Quality Gurus: Walter Shewart, Edward Deming, C.K Pralhad

c) Change Management: Meaning, Need for Planned change, Three- Step-Model of Change (Unfreezing, Moving, Refreezing), The Japanese Models of Change: Just-in-Time, Poka yoke, Cost of Quality: Appraisal Costs, Failure costs and Preventable costs, Cost Benefit Analysis, Cost Effective Analysis, Indian and International Quality Assurance Agencies: Objectives, Functions, Roles and Initiatives (National Assessment Accreditation Council [NAAC], Performance Indicators, Quality Council of India [QCI] , International Network for Quality Assurance Agencies in Higher Education [INQAAHE].

UNIT 9: Inclusive Education

a) Inclusive Education: Concept, Principles, Scope and Target Groups (Diverse learners; Including Marginalized group and Learners with Disabilities), Evolution of the Philosophy of

Inclusive Education: Special, Integrated, Inclusive Education, Legal Provisions: Policies and Legislations (National Policy of Education (1986), Programme of Action of Action (1992), Persons with Disabilities Act (1995), National Policy of Disabilities (2006), National Curriculum Framework (2005), Concession and Facilities to Diverse Learners (Academic and Financial), Rehabilitation Council of India Act (1992), Features of UNCRPD (United Nations Convention on the Rights of Persons with Disabilities) and its Implication

b) Concept of Impairment, Disability and Handicap, Classification of Disabilities based on ICF Model, Readiness of School and Models of Inclusion, Prevalence, Types, Characteristics and Educational Needs of Diverse learners' Intellectual, Physical and Multiple Disabilities, Causes and prevention of disabilities, Identification of Diverse Learners for Inclusion, Educational Evaluation Methods, Techniques and Tools

c) Planning and Management of Inclusive Classrooms: Infrastructure, Human Resource and Instructional Practices, Curriculum and Curricular Adaptations for Diverse Learners, Assistive and Adaptive Technology for Diverse learners: Product (Aids and Appliances) and Process (Individualized Education Plan, Remedial Teaching), Parent- Professional Partnership: Role of Parents, Peers, Professionals, Teachers, School

d) Barriers and Facilitators in Inclusive Education: Attitude, Social and Educational, Current Status and Ethical Issues of inclusive education in India, Research Trends of Inclusive Education in India

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR GEOGRAPHY

UNIT-I
Geomorphology

Continental Drift, Plate Tectonics, Endogenetic and Exogenetic forces. Denudation and Weathering, Geomorphic Cycle (Davis and Penck), Theories and Process of Slope Development, Earth Movements (seismicity, folding, faulting and vulcanicity), Landform Occurrence and Causes of Geomorphic Hazards (earthquakes, volcanoes, landslides and avalanches)

UNIT –II
Climatology

Composition and Structure of Atmosphere; Insolation, Heat Budget of Earth, Temperature, Pressure and Winds, Atmospheric Circulation (air-masses, fronts and upper air circulation, cyclones and anticyclones (tropical and temperate), Climatic Classification of Koppen & Thornthwaite, ENSO Events (El Nino, La Nina and Southern Oscillations), Meteorological Hazards and Disasters (Cyclones, Thunderstorms, Tornadoes, Hailstorms, Heat and Cold waves Drought and Cloudburst , Glacial Lake Outburst (GLOF), Climate Change: Evidences and Causes of Climatic Change in the past, Human impact on Global Climate.

UNIT-III
Oceanography

Relief of Oceans, Composition: Temperature, Density and Salinity, Circulation: Warm and Cold Currents, Waves, Tides, Sea Level Changes, Hazards: Tsunami and Cyclone

UNIT –IV
Geography of Environment

Components: Ecosystem (Geographic Classification) and Human Ecology, Functions: Trophic Levels, Energy Flows, Cycles (geo-chemical, carbon, nitrogen and oxygen), Food Chain, Food Web and Ecological Pyramid, Human Interaction and Impacts, Environmental Ethics and Deep Ecology, Environmental Hazards and Disasters (Global Warming, Urban Heat Island, Atmospheric Pollution, Water Pollution, Land Degradation), National Programmes and Policies: Legal Framework, Environmental Policy, International Treaties, International Programmes and Polices (Brundtland Commission, Kyoto Protocol, Agenda 21, Sustainable Development Goals, Paris Agreement)

UNIT –V

Population and Settlement Geography

Population Geography

Sources of population data (census, sample surveys and vital statistics, data reliability and errors). World Population Distribution (measures, patterns and determinants), World Population Growth (prehistoric to modern period). Demographic Transition, Theories of Population Growth (Malthus, Sadler, and Ricardo). Fertility and Mortality Analysis (indices, determinants and world patterns). Migration (types, causes and consequences and models), Population Composition and Characteristics (age, sex, rural-urban, occupational structure and educational levels), Population Policies in Developed and Developing Countries.

Settlement Geography

Rural Settlements (types, patterns and distribution), Contemporary Problems of Rural Settlements (rural-urban migration; land use changes; land acquisition and transactions), Theories of Origin of Towns (Gordon Childe, Henri Pirenne, Lewis Mumford), Characteristics and Processes of Urbanization in Developed and Developing Countries (factors of urban growth, trends of urbanisation, size, structure and functions of urban areas). Urban Systems (the law of the primate city and rank size rule) Central Place Theories (Christaller and Losch), Internal Structure of the City, Models of Urban Land Use (Burgess, Harris and Ullman , and Hoyt), Concepts of Megacities, Global Cities and Edge Cities, Changing Urban Forms (peri-urban areas, rural-urban fringe, suburban , ring and satellite towns), Social Segregation in the City, Urban Social Area Analysis, Manifestation of Poverty in the City (slums, informal sector growth, crime and social exclusion).

Unit–VI:

Geography of Economic Activities and Regional Development

Economic Geography

Factors affecting spatial organisation of economic activities (primary, secondary, tertiary and quarternary), Natural Resources (classification, distribution and associated problems), Natural Resources Management. World Energy Crises in Developed and Developing Countries.

Agricultural Geography

Land capability classification and Land Use Planning, Cropping Pattern: Methods of delineating crop combination regions (Weaver, Doi and Rafiullah), Crop diversification, Von Thunen's Model of Land Use Planning. Measurement and Determinants of Agricultural Productivity, Regional variations in Agricultural Productivity, Agricultural Systems of the World.

Industrial Geography

Classification of Industries, Factors of Industrial Location; Theories of Industrial Location (A. Weber, E. M. Hoover, August Losch, A. Pred and D. M. Smith). World Industrial Regions, Impact of Globalisation on manufacturing sector in Less Developed Countries, Tourism Industry, World distribution and growth of Information And Communication Technology (ICT) and Knowledge Production (Education and R & D) Industries.

Geography of Transport and Trade

Theories and Models of spatial interaction (Edward Ullman and M. E. Hurst) Measures and Indices of connectivity and accessibility; Spatial Flow Models: Gravity Model and its variants, World Trade Organisation, Globalisation and Liberalisation and World Trade Patterns. Problems and Prospects of Inter and Intra Regional Cooperation and Trade.

Regional Development

Types of regions, Planning Processes: (i) Sectorial & Spatial (ii) Short term and long term, multi-level planning and decentralized planning, Regional development and social movements in India, Developmental Strategies: (i) Hilly and Tribal Regions (ii) Problematic Regions of Drought and Flood, Rostow' stage Theory of growth, Growth Pole Theory, Core Periphery Model, Measurements of level of Regional Development and Disparities.

Unit – VII: Cultural, Social and Political Geography

Cultural and Social Geography

Concept of Culture, Cultural Complexes, Areas and Region, Cultural Heritage, Cultural Ecology. Cultural Convergence, Social Structure and Processes, Social Well-being and Quality of Life, Social Exclusion, Spatial distribution of social groups in India (Tribe, Caste, Religion and Language), Environment and Human Health, Diseases Ecology, Nutritional Status (etiological conditions, classification and spatial and seasonal distributional patterns with special reference to India) Health Care Planning and Policies in India, Medical Tourism in India.

Political Geography

Boundaries and Frontiers (with special reference to India), Heartland and Rimland Theories. Trends and Developments in Political Geography, Geography of Federalism, Electoral Reforms in India, Determinants of Electoral Behaviour, Geopolitics of Climate Change, Geopolitics of World Resources, Geo-politics of India Ocean, Regional Organizations of Cooperation (SAARC, ASEAN, OPEC, EU). Neopolitics of World Natural Resources.

Unit VIII: Geographic Thought

Contributions of Greek, Roman, Arab, Chinese and Indian Scholars, Contributions of Geographers (Bernhardus Varenius, Immanuel Kant, Alexander von Humboldt, Carl Ritter, Scheafer & Hartshorne), Impact of Darwinian Theory on Geographical Thought. Contemporary trends in Indian Geography: Cartography, Thematic and Methodological contributions. Major Geographic Traditions (Earth Science, man-environment relationship, area studies and spatial analysis), Dualisms in Geographic Studies (physical vs. human, regional vs. systematic, qualitative vs. quantitative, ideographic vs. nomothetic), Paradigm Shift, Perspectives in Geography (Positivism, Behaviouralism, Humanism, Structuralism, Feminism and Postmodernism).

Unit IX: Geographical Techniques

Sources of Geographic Information and Data (spatial and non-spatial), Types of Maps, Techniques of Map Making (Choropleth, Isarithmic, Dasymetric, Chorochromatic, Flow Maps) Data Representation on Maps (Pie diagrams, Bar diagrams and Line Graph, GIS Database (raster and vector data formats and attribute data formats). Functions of GIS (conversion, editing and analysis), Georeferencing (coordinate system and map projections and Datum), Basics of Remote Sensing (Electromagnetic Spectrum, Sensors and Platforms, Resolution and Types, Elements of Air Photo and Satellite Image Interpretation and Photogrammetry), Types of Aerial Photographs, Applications of Measures of Central Tendency, Dispersion and Inequalities, Sampling, Sampling Procedure and Hypothesis Testing (*chi* square test, *t* test, ANOVA), Time Series Analysis, Correlation and Regression Analysis, Measurement of Indices, Computation of Composite Index, Principal Component Analysis and Cluster Analysis, Morphometric Analysis: Ordering of Streams, Bifurcation Ratio, Drainage Density and Drainage Frequency, Basin Circularity Ratio and Form Factor, Profiles, Slope Analysis, Clinographic Curve, Hypsographic Curve and Altimetric Frequency Graph.

Unit – X: Geography of India

a) Major Physiographic Regions and their Characteristics; Drainage System (Himalayan and Peninsular), Climate: Seasonal Weather Characteristics, Climatic Divisions, Indian Monsoon (mechanism and characteristics), Jet Streams and Western Disturbances, Types and Distribution of Natural Resources: Soil, Vegetation, Water, Mineral and Marine Resources. Population Characteristics (spatial patterns of distribution), Growth and Composition (rural-urban, age, sex,), Determinants of Population, Population Policies in India, Agriculture (Production, Productivity and Yield of Major Food Crops), Major Crop Regions, Regional Variations in Agricultural Development, Agro-Climatic Zones, Industrial Regions and their characteristics, Industrial Policies in India.

b) Physiography and Climate of Jammu & Kashmir, Types and distribution of natural resources (Soil, Water and natural vegetation). Drainage System, Population: Distribution, Density and Composition. Agriculture and Horticulture Sector in J&K, Tourism Resources and energy resources of J&K.

Subject: Geology/ Applied Geology

1. THE EARTH AND THE SOLAR SYSTEM

Milky Way and the solar system. Modern theories on the origin of the Earth and other Planetary bodies. Earth's orbital parameters, Kepler's laws of planetary motion, Geological Time Scale; Space and time scales of processes in the solid Earth, atmosphere and oceans. Radioactive isotopes and their applications. Basic principles of stratigraphy. Theories about the origin of life and the nature of fossil record. Earth's gravity and magnetic fields and its thermal structure: Concept of Geoid and, spheroid; Isostasy. Basic concepts of seismology and internal structure of the Earth. Physico-chemical and seismic properties of Earth's interior. Earthquakes – their causes and measurement. Interplate and intraplate seismicity. Palaeomagnetism, sea floor spreading and plate tectonics.

Origin and evolution of oceans; Sea level fluctuations and their causes; Topographic features of the ocean floor; Coral reefs; bathymetry and sediments of the Indian Ocean. Marine resources; Exclusive Economic Zone (EEZ) and its marine minerals resources; Marine pollution.

2. CRYSTALLOGRAPHY AND MINERALOGY

Fundamentals of mineral, crystals and silicate structures; Crystal classes and projections; space lattice and symmetry; Internal structure of minerals and crystals; X-ray crystallography; Interaction of light with minerals, principles of optical properties of minerals; Optical instruments and accessories; Polarization of light – methods and applications; Mineral extinction; Refractive indices and vibration directions; Optical Indicatrix; Interference figures; Optic angle; Pleochroism and pleochroic schemes; Dispersion in biaxial minerals.

Classification of minerals: Silicates, Oxides, Sulphates, Halides, Carbonates, Native Metals. General structure, distinguishing features and paragenesis of native elements, major oxides and hydroxides, sulphates and sulphides, carbonates and phosphates, and atomic minerals.

3. PETROLOGY

Steady-state geotherms; Magma generation, properties, emplacement and crystallization of magmas. Phase equilibrium studies of simple systems, effect of volatiles on melt equilibria. Magma -mixing, - mingling and -immiscibility.

Classification schemes of igneous rocks: IUGS and Chemical classification of igneous rocks, forms, structures and textures of igneous rocks.

Petrogenetic aspects of important rock suites of India, such as the Deccan Traps, layered intrusive complexes, anorthosites, carbonatites, charnockites, alkaline rocks, Kimberlites, ophiolites and granitoids.

Source and tectonic setting of different Magma Types: Intraplate magmatism, mantle plume, oceanic island; Basaltic, granitic and alkaline magmas.

Metamorphism and metamorphic processes; factors controlling metamorphism; role of fluids in metamorphism; types of metamorphism; Index minerals; Mineral assemblages; metamorphic differentiation. Metamorphic facies: detailed description of each facies of low pressure, medium to high pressures and very high pressure.

Metamorphic structures and textures; isograds and facies; Mineral reactions with condensed phases, solid solutions, mixed volatile equilibria and thermobarometry. Metamorphism of pelites, mafic, ultramafic rocks and siliceous dolomites. Material

transport during metamorphism. P-T-t path in regional metamorphic terrains, plate tectonics and metamorphism.

4. SEDIMENTOLOGY AND STRATIGRAPHY

Classification of sediments and sedimentary rocks; clastic, volcanoclastic and chemical. Flow regimes and processes of sediment transport. Sedimentary textures and structures. Sedimentary facies and environments, reconstruction of palaeoenvironments. Formation and evolution of sedimentary basins. Diagenesis of siliciclastic and carbonate rocks.

Recent developments in stratigraphic classification. Code of stratigraphic nomenclature – Stratotypes, Global Boundary Stratotype Sections and Points (GSSP). Lithostratigraphic, chronostratigraphic and biostratigraphic subdivisions. Methods of startigraphic correlation. Concept of sequence stratigraphy. Rates of sediment accumulation, unconformities. Facies concept in Stratigraphy – Walther's law. Methods for palaeogeographic reconstruction. Earth's Climatic History. Precambrian and Phanerozoic stratigraphy of India with reference to the type areas– their correlation with equivalent formations in other regions. Boundary problems in Indian Phanerozoic stratigraphy.

5. STRUCTURAL GEOLOGY AND GEOTECTONICS

Theory of stress and strain. Behaviour of rocks under stress. Mohr circle. Various states of stress and their representation by Mohr circles. Different types of failure and sliding criteria. Geometry and mechanics of fracturing and conditions for reactivation of pre-existing discontinuities. Common types of finite strain ellipsoids. L-, L-S-, and S-tectonic fabrics. Techniques of strain analysis. Particle paths and flow patterns. Progressive strain history. Introduction to deformation mechanisms. Role of fluids in deformation processes. Geometry and analyses of brittle-ductile and ductile shear zones. Sheath folds. Geometry and mechanics of development of folds, boudins, foliations and lineations. Interference patterns of superposed fold. Fault-related folding. Gravity induced structures. Tectonic features of extensional-, compressional-, and strike-slip-terrains and relevance to plate boundaries. mantle plumes.

Himalayan Orogeny; concept of super continent, their assembly and breakup.

6. PALEONTOLOGY AND ITS APPLICATIONS

Theories on origin of life. Organic evolution – Punctuated Equilibrium and Phyletic Gradualism models. Mass extinctions and their causes. Application of fossils in age determination and correlation. Paleoecology, Life habitats and various ecosystems, Paleobiogeography. Modes of preservation of fossils and taphonomic considerations. Types of microfossils. Environmental significance of fossils and trace fossils. Application of palynology. Use of microfossils in interpretation of sea floor tectonism. Application of micropaleontology in hydrocarbon exploration. Oxygen and Carbon isotope studies of microfossils and their use in palaeoceanographic and palaeoclimatic interpretation. Important invertebrate fossils, vertebrate fossils, plant fossils and microfossils in Indian stratigraphy.

7. ECONOMIC GEOLOGY

Magmatic, hydrothermal and surface processes of ore formation. Metallogeny and its relation to crustal evolution; Active ore-forming systems, methods of mineral deposit studies including ore microscopy, fluid inclusions and isotopic systematics; ores and metamorphism- cause and effect relationships. Geological setting, characteristics, and genesis of ferrous, base and noble metals. Origin, migration and entrapment of

petroleum; properties of source and reservoir rocks; structural, stratigraphic and combination traps. Methods of petroleum exploration. Concepts of petrophysics, Petroliferous basins of India. Origin of coal. Classification, rank and grading of coal; coal petrography, coal resources of India. Gas hydrates and coal bed methane. Nuclear and non-conventional energy resources.

8. QUATERNARY GEOLOGY

Evolution of landforms; Quaternary Stratigraphy – Oxygen Isotope stratigraphy, biostratigraphy and magnetostratigraphy. Quaternary climates – glacial-interglacial cycles, eustatic changes, proxy indicators of palaeoenvironmental/ palaeoclimatic changes, - land, ocean and cryosphere (ice core studies). Responses of geomorphic systems to climate, sea level and tectonics on variable time scales in the Quaternary, Quaternary dating methods, –radiocarbon, Uranium series, Luminescence, Amino-acid. Quaternary stratigraphy of India– continental records (fluvial, glacial, aeolian, palaeosols and duricrust); marine records; continental-marine correlation of Quaternary record.

Evolution of man and Stone Age cultures. Plant and animal life in relation to glacial and interglacial cycles during Quaternary. Morphotectonic evolution of Indian Quaternary sedimentary basins;

Tectonic geomorphology, neotectonics, active tectonics and their applications to natural hazard assessment.

9. HYDROGEOLOGY

Origin, occurrence and distribution of water: Hydrological properties of aquifers; Hydrostratigraphic units, water table contour maps and flow net analysis. Concepts of drainage basin and groundwater basin; Darcy's law

Water well and well hydraulics: Groundwater exploration; Drilling methods, Welll development methods; Effluent and influent seepage, Unconfined, confined, steady, unsteady and radial flow to the well. Pump test methods, data analysis and interpretation of hydrogeologic boundaries, Evaluation of Aquifer parameter using Thiem's, Thies, Cooper-Jacob, Walton and Jacobb-Lohmen's methods. Slug tests. step-draw down test, determination of aquifer parameter, formation and well characteristics and their material relationship.

Conservation, augmentation and management of Water Resources

Water Quality: Physical and chemical properties of water, quality criteria for domestic, irrigation and industrial use, and graphical presentation of water quality data.

Seawater Intrusion in coastal aquifers and remedial measures. Influence of aquifer material on groundwater quality. Water quality estimation and methods of treatment for various uses.

10. ENGINEERING AND ENVIRONMENTAL GEOLOGY

Engineering properties of rocks and physical characteristics of building stones, concretes and other aggregates. Geological investigations for construction of dams, bridges, highways and tunnels. Remedial measures. Mass movements with special emphasis on landslides and causes of hillslope instability. Seismic design of buildings.

Importance of engineering geology; engineering properties of rocks and soil; Geological investigations for civil engineering projects; Rock mass classifications, Slope Mass Rating; Classification and causes of landslides and earthquakes, seismic zones of India

Methodology used for construction of tunnels, dams and bridges

Inter-relationship of Earth, Man and Environment, anthropogenic changes in ecosystem, Ecological spectrum - biotic communities

Components of the geosphere and environment; nitrogen cycle, carbon cycle and phosphorous cycle.

Global warming - increase of CO_2 and N_2O due to industrialization, urbanization, burning of fossil fuels and deforestation, ozone depletion and its impact.

Environmental impact due to use of various energy resources

Waste disposal - toxic, metallic and radioactive waste, planning and management of hazardous waste, carbon sequestration.

CORPORATE TAX PLANNING AND GST

Corporate Tax Planning; Tax Planning with regard to specific Management Decisions; Minimum Alternative Tax (MAT) - Scheme of MAT, Concept of Zero Tax Company, Computation of Book-Profit and Procedure for Computation of MAT; Returns of Income and Assessment; Self Procedures and Role for Assessment and Annual Information Returns; Assessment of Companies.

GST: Administration, Classification and Levy; Time and Place of Supply; Valuation of Taxation Supply; Input Tax Credit and Payment of GST; Procedural Compliance under GST.

CORPORATE AND MANAGEMENT ACCOUNTING

Amalgamation, Absorption and Reconstruction of Corporates; Marginal Costing; Activity-based Costing; Theory of Constraints; Balanced Scorecard; Budgetary Control; Target Costing; Life cycle Costing.

FINANCIAL MANAGEMENT

Time Value of Money; Cost of Capital; Investment Decisions including Capital Budgeting; Financing Decisions including Leverages and Capital Structure; Dividend Decisions; Working Capital Management.

Management of Financial Risk including Market Risk and Operational Risk; Computation of Risks in a Portfolio; Fundamental Analysis of Securities including Qualitative and Quantitative Analysis of Securities; Technical Analysis: Various Theories and Applications in Stock Market Analysis; Security Market Index; Working and Operations of Mutual Funds in India.

Working of Financial Institutions and Financial Markets in India including Use of Various Financial Instruments by Indian Corporates.

BUSINESS ECONOMICS

Theory of Consumer Choice including Cardinal and Ordinal Utility Analysis; Short-run and Long-run Price and Output Decisions under Monopoly, Oligopoly and Perfect Competition; Production Function and Costs Analysis; Trade Cycles; Inflation, Deflation and Stagflation.

STRATEGIC MANAGEMENT

Strategic Management Process: Schools of Thought; Formulation, Administration and Implementation of Strategies; Strategic Evaluation and Control; Designing of Organizational Structure & Systems; Linking Structure to Strategy.

ORGANIZATIONAL BEHAVIOUR

Perception, Personality and Learning; Attitudes and Job Satisfaction; Motivation Theories; Group Dynamics and Team Management; Organizational Leadership; Organizational Culture, Conflict and Change; Management of Stress.

MARKETING MANAGEMENT

Marketing Environment; Consumer Behaviour; Market Segmentation, Targeting and Positioning; Marketing Information System including Marketing Research; Product-mix Decisions; Price-mix Decisions; Place-mix Decisions; Promotion-mix Decisions; Contemporary topics in Marketing: Global marketing, Niche marketing, Social marketing, Viral marketing, Green marketing, Event marketing, Network marketing, and Direct marketing.

HUMAN RESOURCE MANAGEMENT

HR Models and Practices in Global and Indian Context; Job Analysis and Evaluation; HR Planning; Recruitment, Selection and Placement; Training and Performance Appraisal; Incentives and Compensation Plans; Career Development Plans; Strategic HRM.

INTERNATIONAL BUSINESS AND E-COMMERCE

Globalization and International Business; Barriers in International Business; Theories of International Trade; India's Foreign Trade: Composition, Direction and Regulation; International Investment Theories; International Financial Institutions; Foreign Exchange Rate Determination.

Retailing in E-Commerce Products and Services: Internet Marketing and B2C Electronic Retailing; E-Tailing Business Models; B2B E-Commerce Models; B2B Exchanges; B2B Portals and Directories; B2B in Web2.0; Social Networking.

QUANTITATIVE TECHNIQUES

Linear Programming; PERT and CPM Network Analysis and Simulation; Game Theory and Decision Theory; Questionnaire Design; Sampling Techniques; Data Collection Forms; Hypothesis Testing; Statistical Techniques: Correlation and Regression.

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR POLITICAL SCIENCE

UNIT 1: WESTERN POLITICAL THOUGHT (THINKERS AND TEXTS)

i. Classical Texts and Interpretive Approaches
ii. Plato: *The Republic*
iii. Aristotle: *The Politics*
iv. St. Augustine: *The City of God*
v. Niccolo Machiavelli: *The Prince*
vi. Thomas Hobbes: *The Leviathan*
vii. John Locke: *The Second Treatise*
viii. J.J. Rousseau: *The Social Contract*
ix. Jeremy Bentham: *History of Legislation and Morals*
x. J.S. Mill: *On Liberty, Subjection of Women*
xi. Friedrich Hegel: *Philosophy of Right*
xii. Karl Marx (and Friedreich Engels): *Critique of Political Economy,* and *The Communist Manifesto*

UNIT 2: POLITICAL THEORY

i. Political Theory: Evolution and Growth from Classical to Contemporary Times
ii. Debate on Decline and Resurgence of Political Theory
iii. Scientific and Normative Debates: Positivism and Post-positivism
iv. Carl Schmitt: Concept of Political, and Democracy
v. Isiah Berlin: Two Concepts of Liberty
vi. C.B. Macpherson: Democracy, and Possessive Individualism
vii. Liberalism: Classical and Modern
viii. Conservatism
ix. Socialism
x. Marxism

UNIT 3: CONTEMPORARY POLITICAL THEORY

i. Contemporary Liberalism: John Rawls, Ronald Dworkin, Amartya Sen
ii. Libertarianism: Robert Nozick
iii. Communitarianism: Michael Sandel, Michael Walzer
iv. Multiculturalism: Will Kymlicka, Bhikhu Parekh
v. Neo-Marxism: Antonio Gramsci, Louis Althusser
vi. Nationalism: Benedict Anderson, Partha Chatterjee
vii. Postmodernism: Jean-Francois Lyotard, Michel Foucault
viii. Feminism: Mary Wollstonecraft, Simone de Beauvoir, Judith Butler
ix. Ecologism

UNIT 4: MODERN INDIAN POLITICAL THOUGHT

i. Indian Renaissance: Raja Ram Mohan Roy, Sir Syed Ahmad Khan, Jyotirao Phule
ii. Civic Nationalism: M.K. Gandhi, Maulana Azad
iii. Cultural Nationalism: V.D. Savarkar, Mohammad Ali Jinnah
iv. Alternative Discourses: E.V. Ramaswamy Naicker, Rabindranath Tagore
v. Satyagraha and Non-violence: M.K. Gandhi
vi. Secularism and Democratic Socialism: Jawaharlal Nehru
vii. Emancipatory Thought: B.R. Ambedkar
viii. National Integration and Secularism: Sardar Vallabhai Patel
ix. Communist Thought: M.N. Roy, E.M.S. Namboodiripad
x. Socialist Thought: Ram Manohar Lohia, J.P. Narayan
xi. Feminist Thought: Pandita Ramabhai, Savitri Bai Phule

UNIT 5: INDIAN POLITICAL SYSTEM

i. Nature and Impact of Colonialism: Economic, Social, and Political
ii. Freedom Struggle: Ideology, Strategy and Main Phases
iii. Constitution: Evolution, Ideological Basis and Characteristic Features
iv. Constitutionalism in India
v. Nature of State: Democratic, Developmental and Coercive
vi. Federalism: Structure, Nature, and Emerging Trends
vii. Parliament: Changing Nature of Representation
viii. Judicial System: Role in Safeguarding Constitution, and Social Transformation; Judicial Activism
ix. Dynamics of Indian Party System
x. Electoral System, and Electoral Reforms
xi. Ethnicity, Caste, Religion, Class and Gender in Indian Politics
xii. Impact of Liberalization, Privatization, and Globalization (LPG) Reforms on Indian Polity

UNIT 6: COMPARATIVE POLITICS AND SOUTH ASIA

i. Comparative Politics: Meaning, Nature, and Scope
ii. Approaches: Institutional, Political Culture, Political Economy, New Institutionalism, and Comparative Methods
iii. State Theory: Debate over the Nature of State in Capitalist and Socialist Societies, Postcolonial State, Welfare State, Globalization and Nation-states
iv. Political Regimes: Democratic (Electoral, Liberal, Majoritarian and Participatory) and Non-democratic regimes (Military dictatorship, Authoritarian and Fascist)
v. Theories of Political Development
vi. Theories of Dependency: AG Frank, Immanuel Wallerstein, Samir Amin
vii. Theories of Ruling Class and Elites: Pareto, Michels, and Mosca
viii. Nation-building in South Asia: Religion, Ethnicity and Language
ix. Nature of Postcolonial State in South Asia: India, Pakistan, and Nepal
x. Nature of Regimes in South Asia: Democratic, Praetorian, and Authoritarian
xi. Debates of State Security, Human Security, and Human Development in South Asia

UNIT 7: INTERNATIONAL RELATIONS: THEORIES AND PRACTICE

i. Evolution of IR as distinct Discipline
ii. The Great Debates on Discipline: Realists and Idealists; Traditionalists and Behaviouralists
iii. Realism and Neo-Realism.
iv. Liberalism and Neo-Liberalism
v. Marxism and Neo-Marxism
vi. Critical Theory
vii. Social Constructivism
viii. Feminism
ix. National Power, Balance of Power, and National Interest: Changing Dynamics
x. Diplomacy: Nature, Scope, Types and Importance
xi. Collective Security and Collective Defense: Theory and Practice
xii. Multilateralism in International Relations: Global and Regional (UN, WTO, World Bank, EU and ASEAN
xiii. Politics on Climate Change: North vs. Global South
xiv. Global Justice Debate

UNIT 8: INDIA'S FOREIGN POLICY

i. Perspectives on India's Foreign Policy: India's Identity as postcolonial, development, rising power and as emerging political economy
ii. Continuity and change in India's Foreign Policy: Principles and determinants; Non-Alignment movement: historical background and relevance of Non-Aligned Movement; India's Nuclear Policy
iii. India's relations with major powers: USA, USSR/Russia, People's Republic of China
iv. India's Engagement with multipolar world: India's relations with European Union, BRICS, ASEAN, Shanghai Cooperation Organisation, African Union, Southern African Development Community, Gulf Cooperation Council
v. India's relations with neighbourhood: SAARC, Gujaral doctrine, Look East/ Act East, Look West.
vi. India's Negotiation Strategies in International Regimes: The United Nations, World Trade Organisation, International Monetary Fund, Intergovernmental Panel on Climate Change.
vii. Contemporary challenges: maritime security, energy security, environmental security, migrants and refugees, water resources, international terrorism, cyber security

UNIT 9: STATE POLITICS IN INDIA

i. State Politics in India: Theoretical Perspectives
ii. Organization and Re-organization of Indian States
iii. Interstate Dispute: Institutional Mechanism for Resolution
iv. Constitutional Protection for Special Category States/Groups (Article 371, Schedule 5th and 6th)
v. Caste and Politics in Uttar Pradesh
vi. Ethnicity in State Politics: North-East India
vii. Regional Assertion and Autonomy: Tamil Nadu and Punjab
viii. Regional Disparities and Un-even Economic Development
ix. Politics of Land Reforms: West Bengal and Jammu & Kashmir
x. Agrarian Crisis: Impact on Politics of Maharashtra, Andhra Pradesh, and Punjab
xi. Naxalite Movement and its Impact on Politics and Development in Chhattisgarh, Jharkhand and Odisha

UNIT 10: PUBLIC ADMINISTRATION AND INDIAN ADMINISTRATION

i. Public Administration: Meaning, Nature and Scope
ii. New Public Administration to New Public Management
iii. Development Administration and Comparative Administration: Changing Patterns
iv. Approaches to the Study of Public Administration: Scientific Management, and Human Relations
v. Principles of Organization: Hierarchy, Authority and Span of Control
vi. Weber's Bureaucratic Model and its Critique
vii. Decision Making Approach of Herbert Simon
viii. Theories of Motivation: Maslow, Herzberg, Mac Gregor
ix. Evolution and Features of Indian Administration
x. Good Governance Initiatives in India: Lokpal and Lokayukta
xi. Role of Information Technology in Indian Administration
xii. Impact of LPG Reforms on Indian Administration
xiii. Accountability and Transparency in India: Accountability Commission, Information Commission

SUBJECT: **STATISTICS**

SYLLABUS

UNIT I - PROBABILITY AND DISTRIBUTION THEORY:

Sample space and events, probability measure and probability space, random variable as measurable function, probability distribution function (discrete & continuous) Expectation and Moments of a random variable. Standard discrete and continuous Probability distributions and their structure properties, inter relations and limiting cases. Probability generating & characteristic functions. Modes of convergence, weak and strong laws of numbers, and central limit theorem. Linderberg and Levy forms of Central limit theorem.

UNIT II - STATISTICAL REFERENCE:

Consistency, unbiasedness, efficiency, sufficiency, minimal sufficiency, completeness, ancillary statistic, factorization theorem. Exponential family of distribution and its properties. Uniformly minimum variance unbiased (UMVU) estimation, Rao-Blackwell and Lehman Scheffe theorems, Cramer-Rao's inequality, minimum variance bound estimator and its properties, Chapman Robin's inequality, Bhattacharya's bounds, estimation by method of moments, maximum likelihood least squares, miimum chi-square and modified minimum chi-square, properties of maximum likelihood and other estimators, idea of asymptotic efficiency, idea of prior and Posterior distributions, Bayes estimator.

UNIT III - SAMPLING THEORY:

An outline of fixed population and super population approach, distinctive features of finite population sampling, probability sampling designs, simple random sampling with and without replacement, stratified random sampling, systematic sampling, Ratio and regression and its efficacy for structural populations.

Cluster sampling, two stage sampling and their comparisons and relations. Probability proportional to size sampling with and without replacement, the Hansen-Harwitz and Horvitz-Thomson estimators non negative variance estimation. Non-sampling errors.

UNIT IV - MULTIVARIATE ANALYSIS:

Multivariate normal distribution theory: Joint distribution, conditional distribution, linear function of correlated n characteristics functions of multivariate normal distribut likelihood estimation of mean vector and co-variance ma independence. Distribution of sample mean vector Quadrati distribution. Multiple and Partial correlation coefficient and distributions. Simple regression model and regression coeffic distribution. Canonical correlation and their properties. Mahala Hotelling's T^2 statistics and their applications and properties analysis, principal component analysis and elements of factor a

UNIT V - LINEAR INFERENCE:

Linear statistical model, theory of least squares and analysis o Gauss-Markoff Theory, normal equations, least square estimates precision, test of significance and interval estimates based on least theory in one-way, two-way and three-way classified data, regress orthogonal polynomials, multiple regression, multiple and correlations, regression diagnostic and sensitivity analysis, calibr problems, estimation of variance and co-variance components. Tes hypothesis for one and more than one parametric functions, Test of lin hypothesis and estimable linear hypothesis.

UNIT VI - STATISTICAL REFERENCE:

Design of experiments: Introduction to basic designs and their analysis, fixed effects model (two way classification) random and mixed effects models (two way classification per cell) CRD, RBD, LSD and their analysis, Balance Incomplete Block Design (BIBD) Intra block designs, concepts of orthogonality and balance, missing block techniques, factorial design 2^n, 3^2, 3^3, compounding factorial experiments, split-plot and simple lalic design. Testing the significance of factorial effects.

UNIT VII - INDUSTRIAL STATISTICS THEORY:

Process and product control, general theory of control charts, different types of control charts for variable and attributes, X, R, s, p, np and c charts, cumulative sum charts, V-mask, single double, multiple and sequential sampling plans for attributes, DC, ASN, AOQ and ATI curv

concepts of producers and consumer risks, AQL, LTPD and AOQL, sampling plans for variables.

Concepts of reliability maintainability and availability, reliability of series and parallel systems and other simple configurations, renewal density, renewal function, survival models (exponential) Weibull, lognormal, Raleigh and bath lub).

UNIT VIII - EXACT TESTS (DISTRIBUTIONS) AND NON-PARAMETRIC TESTS:

Sampling distributions, Chi-square test, F-distributions and t-distributions their applications, properties and relations. Non-central t, F and Chi-square distributions. Test of significance of Normal, t, F and Chi-square.

Advantages and disadvantages of non-parametric test. Sign test one sample and two samples Wilcoxon – Signed rank test one and two –samples Wilcoxon – Mann Whitney test, test of randomness based on total number of runs, Wald –Wilfwitz run test. Asymptatic Efficiency.

UNIT IX - OPERATIONS RESEARCH:

Simplex method, Revised simplex method, Transportation, duality theorems, complementary slackness theorem and conditions. Dual simplex method, Sensitivity Analysis Sequencing and scheduling problems, 3 machines n jobs problems with identical machine sequence for all jobs, 2-job n-machine problem with different routings. Project management, PERT and CPM. Decision making in the face of completion, two-person, zero sum games, Games with mixed strategies, existence of solution and uniqueness of value in zero sum games, finding solutions in m x n games.

UNIT X - LINEAR PROGRAMMING:

Linear Programming: Definition of convex set Basic definitions (Solutions to LPP, Feasible solution, Basic solution, Basic feasible solution, optimum basic feasible solution.

Multistage decision process and dynamic programming, Multi-criterion and Goal Programming. EOQ problem with and without shortages with (a) production is stantaneous, Dynamic Programming, Queuing models – specifications and effectiveness measures. Steady – state solutions M/M/1 and M/M/C models with associated distributions of queue – length and waiting time. M/G/1 queue. Steady- state solutions of M/EK/1.

UNIT IV - MULTIVARIATE ANALYSIS:

Multivariate normal distribution theory: Joint distribution, marginal and conditional distribution, linear function of correlated normal variate. characteristics functions of multivariate normal distribution, Maximum likelihood estimation of mean vector and co-variance matrix and their independence. Distribution of sample mean vector Quadratic form and its distribution. Multiple and Partial correlation coefficient and their sampling distributions. Simple regression model and regression coefficient and their distribution. Canonical correlation and their properties. Mahalanobis's D^2 and Hotelling's T^2 statistics and their applications and properties. Discriminat analysis, principal component analysis and elements of factor analysis.

UNIT V - LINEAR INFERENCE:

Linear statistical model, theory of least squares and analysis of variance, Gauss-Markoff Theory, normal equations, least square estimates and their precision, test of significance and interval estimates based on least squares theory in one-way, two-way and three-way classified data, regression and orthogonal polynomials, multiple regression, multiple and partial correlations, regression diagnostic and sensitivity analysis, calibration problems, estimation of variance and co-variance components. Test of hypothesis for one and more than one parametric functions, Test of linear hypothesis and estimable linear hypothesis.

UNIT VI - STATISTICAL REFERENCE:

Design of experiments: Introduction to basic designs and their analysis, fixed effects model (two way classification) random and mixed effects models (two way classification per cell) CRD, RBD, LSD and their analysis, Balance Incomplete Block Design (BIBD) Intra block designs, concepts of orthogonality and balance, missing block techniques, factorial design 2^n, 3^2, 3^3, compounding factorial experiments, split-plot and simple lalic design. Testing the significance of factorial effects.

UNIT VII - INDUSTRIAL STATISTICS THEORY:

Process and product control, general theory of control charts, different types of control charts for variable and attributes, X, R, s, p, np and c charts, cumulative sum charts, V-mask, single double, multiple and sequential sampling plans for attributes, DC, ASN, AOQ and ATI curves,

SUBJECT: **ISLAMIC STUDIES**

SYLLABUS

UNIT 1: ISLAMIC HISTORY (FORMATIVE PERIOD)

1. Topography of Pre-Islamic Arabia.
2. Society and Religion of Pre-Islamic Arabia.
3. Economy and Polity of Pre-Islamic Arabia.
4. Language and Literature of Pre-Islamic Arabia.
5. Holy Qur'an: Revelation, Compilation and Preservation.
6. Prophet Muhammad at Makkah: Life and Mission.
7. Prophet Muhammad at Madinah: Life and Mission.
8. The Constitution of Madinah.
9. Prophet Muhammad: Statesman and Law Giver.
10. Prophet Muhammad's Relation with Ahl Al-Kitab and other states.

UNIT 2: ISLAMIC HISTORY (EARLY CALIPHATE PERIOD)

1. Institution of Khilafah: Origin and Development.
2. Caliph Abu Bakr: Consolidation of State.
3. Caliph Umar: Expansion and Administration.
4. Caliph Uthman: Expansion and Political Developments.
5. Caliph Ali: Role and Policies.
6. Establishment of the Umayad Rule.
7. Prominent Umayyad Rulers: Life and Achievements.
8. Prominent Umayyad Scholars (Religious and others).
9. Umayyad Art and Architecture.
10. Administration and Education System of the Umayyads.

UNIT 3: THE ABBASIDS

1. Establishment of the Abbasid Rule.
2. Prominent Rulers: Life and Achievements.
3. Society and Administration of the Abbasids.
4. Trade and Commerce under the Abbasids.
5. Abbasid Art and Architecture.
6. Translation Movement and Prominent Translators.
7. Development of Religious Sciences.
8. Development of Natural Sciences.
9. Development of Social Sciences.
10. Development of Language and Literature.

UNIT 4: MUSLIM SPAIN

1. Establishment of Muslim Rule in Spain.
2. Prominent Rulers: Life and Achievements.
3. Society and Administration.
4. Trade and Commerce.
5. Art and Architecture.
6. Development of Religious Sciences.
7. Development of Natural and Social Sciences.
8. Prominent Muslim Scholars and their Impact on the West.
9. Disintegration of the Muslim Rule.
10. Fall of Granada and Spanish Inquisition.

UNIT 5: THE OTTOMANS

1. Origin and History of the Turks.
2. Establishment of the Ottoman Rule.
3. Prominent Rulers: Life and Achievements.
4. Trade and Commerce.
5. Art and Architecture.
6. Society and Administration.
7. Development of Religious Sciences.

8. Development of Natural and Social Sciences.
9. The Ottomans and the West.
10. Constitutional Movement and Fall of the Ottoman Empire.

UNIT 6: PROMINENT MUSLIM DYNASTIES

1. Establishment of the Ghaznavid Rule.
2. Administration and Society under the Ghaznavids.
3. Ghaznavid's Contribution to Education (Religious Other).
4. Establishment of the Saljuq Rule.
5. Prominent Saljuq Rulers: Life and Achievements.
6. Administration and Polity of the Saljuqs.
7. Establishment of the Fatimid Rule.
8. Prominent Fatimid Rulers: Life and Achievements.
9. Fatimid's Contribution to Education (Religious and Other).
10. The Crusades: Major Events and Muslim Response.

UNIT 7: ISLAM IN INDIA

1. Early Indo-Arab Relations.
2. Advent of Islam in India (Kerala) and its Impact.
3. Establishment of Delhi Sultanate.
4. Administration and Polity of Delhi Sultanate.
5. Establishment of the Mughal Sultanate.
6. Administration and Polity of the Mughals.
7. Mughal's Contribution to Education (Religious and Other).
8. Mughal Art and Architecture.
9. Trade Art and Architecture.
10. British Colonialism and Role of Muslims in Indian Freedom Struggle (1857 and Onwards).

UNIT 8: ISLAMIC RELIGIOUS SCIENCES (TAFSIR, HADITH AND FIQH)

1. Origin and Development of Tafsir Literature.
2. Classical Tafasir: Al-Tabari, Al-Razi, IBN Kathir.
3. Urdu Tafasir: Nayan-Ul-Quran, Tarjuman-Ul-Quran, Tahim-Ul-Quran.
4. English Tafasir: Marmaduke Pickthall, Abdullah Yusuf-Ali, Abdul Majid Daryabadi.
5. Origin and Development of Hadith Literature.
6. Hadith Sciences: Tadwin, Riwayah, Dirayah, Asma Al-Rijal, Jarah Wa Ta'Dil.
7. Origin and Development of Fiqh Literature.
8. Prominent Schools of Sunni Jurisprudence IHanafi, Maliki, Shafi'I, Hanbali).
9. Prominent Schools of Shia Jurisprudence (Ithna-Ashari, Ismaili, Zaidi).
10. Contribution to Islamic Religious Sciences (Shaykh Ahmad Sirhindi, Shah Wali-Ullah Dehlvi, Shaykh Abdul Haq Muhaddith Dehlvi, Shaykh Yaqoob Sarfi, Anwar Shah Kashmiri).

UNIT 9: MUSLIM PHILOSOPHY AND SUFISM (TASAWWUF)

1. Origin and Development of Muslim Philosophy.
2. Jabriyyah and Qadariyyah.
3. Mutazilah and Ashari.
4. Murjiyyah and Khawarij.
5. Classical Muslim Philosophers (Al-Kindi, Al-Farabi, IBN Sina, Al-Ghazzali, IBN Rushd).
6. Origin and Development of Sufism.
7. Major Sufi Orders: Chishtiyya, Suhrawar-Diyya, Qadiriyya, Naqshabandiyya.

8. Prominent Sufis: Hassan Al-Basri, Junaid Baghdadi, IBN Arabi, Shaykh Ali Hujwiri.
9. IBN Miskawayh, IBN Tufayl.
10. IBN Taimiyyah and Shibli Nomani

UNIT 10: TRENDS, MOVEMENTS AND THINKERS

1. Shah Wali-Ullah and His Movement.
2. Sayyid Ahmad Shaheed and His Movement.
3. Sir Syed Ahmad Khan and Aligarh Movement.
4. Ikhwan Al-Muslimun and Jamat-E-Islami.
5. Young Turk Movement and Nursi Movement.
6. Arab Nationalism: Abdul Rahman Al-Kawakibi.
7. Reformist Thinkers (Muhammad IBN Abdul Wahhab, Muhammad IBN Ali Al-Sanusi, Jamal-ud-Din Afghani, Rashid Rida, Muhammad Abduh).
8. Reformist Thinkers (Hassan Al-Banna, Syed Qutq, Abul Ala Maududi, Ayutullah Khomeini, Ali Shariati).
9. Contemporary (Deoband, Salafi, Barelvi, Nadwa).
10. The Palestinian Issue, The Arab Spring, Conflicts in West Asia (Arab World).

UNIT I: Introduction to Language and Linguistics

- Fundamental Notions about Human Language, Design Features of Language
- Linguistics: Scope; Branches;
- Origin of Human Language.
- Properties of human language
- Sociolinguistics, Communicative competence; Speech Community; language variation(lexical, phonological and syntactic); idiolect, dialect and its types; Isogloss; register; jargon; slang; pidgin; Creole;
- Bilingualism; Multilingualism; Code-mixing; Code Switching. Language Change.
- Key concepts: Langue & Parole; Competence vs. Performance; Sign vs. symbol; Diachronic vs. synchronic Approaches; Syntagmatic vs. Paradigmatic relationships
- Levels of linguistic analysis • Phonetics- Phonology-- Phonemes and allophones
- Morphology – morphemes and allomorphs
- Word formation-inflection and derivation—word-building processes
- Evolution and development of English language.
- Varieties of English: British (R.P); American(NAM)and Indian

UNIT II: English Language Teaching

- Charter Act of 1813, Position of English in India, Three Language Formula, Principles of English Teaching, Problems of Teaching English in India.
- English as Second language/Foreign language, ESP
- Objectives of teaching English at Primary/ secondary and Tertiary level
- Theories of language Learning: Behaviourism — Cognitivism — Acquisition and Learning — Foreign language Learning — Speech-Act theory
- Syllabus, Comparison with Curriculum, Grammatical Syllabus, Notional Syllabus, Communicative Syllabus
- Grammar: Translation Method—Direct Method—Audio-lingual Method
- The Aural-oral Approach—The Structural-situational method—Notional-functional approach—Communicative Approach—Eclectic Method
- Alternative approaches and methods—Learner centred, task-based, content-based
- Curriculum/Syllabus/ Materials and Testing
- Teaching of Listening, Speaking, Reading and Writing.
- Teaching large classes—problems and solutions—Student grouping—group work/pair work—Class room interaction—motivation.
- Teaching Aids: Blackboard; Pictures; Tapes; Videos, Language labs

UNIT III: Phonetics and Phonology

- Scope and Branches
- Sound and Spelling relationship in English
- Organs of Speech; Speech Mechanism
- IPA Symbols and their Importance
- Description of English Consonants
- Cardinal Vowels, description and classification of English vowels
- Phoneme; minimal pairs, allophone; aspiration, assimilation; elision
- Supra-segmental Phonology: Syllable; identification; structure; weak and strong syllable, consonant cluster; syllabic consonant.
- Stress; rules for the placement of stress
- Rhythm (Sentence Stress)
- Intonation; structure of tone unit; types of tones and their uses
- IPA, Symbols and their Importance, Phonetic vs. Phonemic Transcription

UNIT IV: Communication Skills: Speaking and Listening

- Role of Language in Communication, Theory and Models of Communication,
- Purpose of Communication
- Process of Communication
- Barriers to Communication, Measures to Overcome the Barriers to Communication
- Types of Communication, Verbal Communication, Importance of Verbal Communication, Non-verbal Communication and its Significance
- Scope and Types of Communication Network, Formal and Informal Communication Network, Upward Communication, Downward Communication, Horizontal Communication, Diagonal Communication
- Direct and Mediated Communication
- Listening Process, Approaches to Listening, Classification of Listening
- Approaches to Listening, Measures to Improve Listening
- Qualities of a Good Listener
- Speaking Skill, Advantages and Disadvantages
- Planning, Preparing and Delivering a Talk
- Presentations and Public Speaking, Monologue, Dialogue, Group Discussions, Interviews, Telephonic Conversation

UNIT V: Communication Skills: Reading and Writing

- Reading Skill: Linguistic Approach to Reading .
- Purpose of Reading
- Types of Reading: Intensive and Extensive Reading
- Techniques and Strategies of Reading
- Sub-skills of Reading
- Writing Skills: Approaches to Writing
- Principle of CODER: Collection of Ideas (free writing, brainstorming, clustering, looping), Organizing, Drafting, Editing and Redrafting, Describing Persons, Places, Objects and Events, Summarizing and Elaborating
- Written Communication: Writing Report, Letter, Paragraph, Essay, Memo, CV, Minutes of a Meeting, E-Mails and Advertisements
- Qualities of Good Handwriting; Defects in Writing Skills and their Improvement
- Body Language: Introduction, Interpretation, and Controlling your Body Language
- Social significance of Body Language
- Role of Silence in Communication.

UNIT VI: Communication in Real Life Situations

- Prescriptive/ descriptive approaches - grammaticality — acceptability — appropriateness - grammar in context - grammar in spoken and written English - Collocation
- *Referring to people and things and giving additional information about them*
  Identifying people and things (nouns) - referring to people/things without naming them (pronouns) - identifying what is being talked about (determiners) - describing people/ things (adjectives) - words used as classifiers, quantifiers, qualifiers etc.
- *Making a message*
  Transitivity/ intransitivity - complementation - talking about closely linked action - using two verbs together (eg:- She stopped crying)
- *Transforming messages*
  Making statements, questions, orders and suggestions - denying - rejecting - disagreeing -possibility - ability, permission, obligation etc
- Expressing time
- Referring to present, past and future time - use of adjuncts - frequency and duration.
- Talking about manner and place Information about place, manner - position of adjuncts - types of adverbs (time, frequency, duration etc)
- Reporting what people say/think Reporting verbs - reporting someone's actual words - reporting in one's own words.

- The structure of information Focusing on the thing affected (passive voice) - selecting focus (left structure) taking the focus off the subject (impersonal 'it' etc.) – Introducing something new (with 'there') - focusing on information using adjuncts.

UNIT VII: Translation Studies

- Linguistics and Translation, Definition and Theories of Translation
- Process of Translation, Source Language and Target Language
- Text Analysis and Restructuring, Analysis of Meaning
- Different Types of Translation: Intralingual and Interlingual, Full and Partial, Total and Restricted; Rank Bound and Unbounded Translation
- Issues in Translation: Equivalence, Loss and Gain, False Friends, Translation Shifts, Untranslatability, Paraphrasing, Transformation, Transliteration
- Kinds of Texts: Translation of Technical Texts, Legal Text, Religious and Literary texts
- Translation vs. Transcreation
- Techniques of Adjustment: Additions, Subtractions, Alterations
- Literary Translation: Translation of Poetry and Prose, Official Documents, News Reports, Advertisements, Translating Radio and TV Scripts
- Basic Principles of Subtitling

UNIT VIII: Language and Media

- Mass Media; Nature, Form and Functions
- Electronic and Print Media; Online Media; Social Media and Cyber Media
- Journalistic Writing; Journalistic Writing vs. Creative Writing; Journalistic Ethics
- Writing for Newspaper, Elements of News; Characteristics of News
- Writing Headlines; Writing Editorials; Writing Columns, Picture Editing; Writing Articles and Features
- Definition and Role of an Editor; News Editor and Sub-Editor; Language and Style of Editing
- News Agencies: Definition; National News Agencies; Global News Agencies
- Radio and TV as Mass Media, Characteristics of Broadcast Writing
- E-Book; E-Magazine; E-Journal, Internet; Web

UNIT IX: Advertising: Theory and Practice

- Advertising – Definitions--Origin and development of advertising
- Economic impact of advertising--new trends in advertising.
- Advertising as a Process; Four components: the advertiser, the advertisement, the ad agency and the mass media
- Ad. Agency: Structure, Function and Characteristics of a good ad agency--Media selection criteria--Client satisfaction.
- Advertisement and Creativity
- Advertisement types: Product, Service, Industrial, Institutional, Public Service
- Advertisements: Appearance Vs. Reality
- Media wise category: Print media ads, Electronic media ads (Radio, TV and Film) and New Media ads.
- Non-Mass Media ads: Graffiti, Billboards, fliers, novelties etc.
- Copy writing, copy creativity, copy structure, text: Headline, slogan, body copy
- Copy style, credibility, readability. Qualities of a good copy writer
- Visualization of Advertisements: Typography, Illustration, Logo, Trademarks, Themes, Graphics, Appeals, Animation, Special Effects and basic principles of Designing

UNIT X: Academic Writing and Soft Skills

- Academic Writing: Definition and Scope
- Categories of Academic Writing
- Rules, Characteristics and Style of Academic Writing; Composing, Paraphrasing and Editing
- Academic Writing and Composition
- Language and Style of Academic Writing; Sentence Generation, Paragraph Development
- Formal Style and Vocabulary
- Grammar and Punctuation
- Understanding Group Dynamics, Group Conflict and their Resolution
- Arguments, Creativity and Critical Thinking
- Kinesics and Proxemics

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR ENGLISH tment) in

1. **British Literature**
   a. Drama
      - From Renaissance to the 20th century
   b. Poetry
      - From Chaucer to the 20th century
   c. Novel
      - 18th century to the 20th century
   d. Non-fictional Prose
      - From Francis Bacon to the 20th century
2. **American Literature**
   a. Poetry
      - 19th to 20th century
   b. Drama
      - 20th Century
   c. Novel
      - 19th century to the 20th century
3. **Literary Criticism**
   - Classical
   - Romantic
   - Victorian
   - Early Modern till T S Eliot
   - New Criticism

4. **Critical Theory**

   - Structuralism and Post-structuralism
   - Postmodernism
   - Postcolonialism
   - Feminist theory
   - New Historicism

5. **Indian Writing in English (Pre and post-independence literature)**

   - Novel 19th century to the present
   - Poetry 19th and 20th century
   - Drama 20th century

6. **Literary Terms and Devices**

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR PUNJABI

Syllabus of Punjabi

Unit-I **ਸਾਹਿਤ, ਸਾਹਿਤ ਰੂਪ, ਸਾਹਿਤ ਸ਼ਾਸਤਰੀ ਪਰੰਪਰਾ, ਸਾਹਿਤ ਇਤਿਹਾਸਕਾਰੀ ਅਤੇ ਜੰਮੂ ਕਸ਼ਮੀਰ ਦੇ ਪੰਜਾਬੀ ਸਾਹਿਤ ਦਾ ਇਤਿਹਾਸ**

- ਸਾਹਿਤ: ਪਰਿਭਾਸ਼ਾ, ਸਰੂਪ ਤੇ ਤੱਤ ।
- ਸਾਹਿਤ ਦਾ ਹੋਰ ਅਨੁਸ਼ਾਸਨਾਂ ਨਾਲ ਸਬੰਧ (ਭਾਸ਼ਾ, ਸਮਾਜ, ਇਤਿਹਾਸ, ਮਨੋਵਿਗਿਆਨ, ਸਭਿਆਚਾਰ, ਧਰਮ, ਦਰਸ਼ਨ ਅਤੇ ਰਾਜਨੀਤੀ) ।
- ਸਾਹਿਤ ਪ੍ਰਗਟਾਅ ਦੀਆਂ ਵਿਧੀਆਂ : ਕਾਵਿਕ, ਬਿਰਤਾਂਤਿਕ ਅਤੇ ਨਾਟਕੀ ।
- ਸਾਹਿਤ, ਸਾਹਿਤ ਵਿਗਿਆਨ ਅਤੇ ਸਾਹਿਤ ਇਤਿਹਾਸ ਦਾ ਅੰਤਰ-ਨਿਖੇੜ।
- **ਸਾਹਿਤ ਦੇ ਰੂਪ:**
  - **ਮੱਧਕਾਲੀ ਰੂਪ:** ਸ਼ਬਦ, ਸਲੋਕ, ਕਾਫ਼ੀ, ਬਾਰਾਮਾਹ, ਸੀਹਰਫ਼ੀ, ਕਿੱਸਾ, ਵਾਰ, ਜੰਗਨਾਮਾ, ਜਨਮ-ਸਾਖੀ, ਟੀਕਾ ਅਤੇ ਪਰਚੀਆਂ।
  - **ਆਧੁਨਿਕ ਰੂਪ:** ਗੀਤ, ਨਜ਼ਮ, ਗ਼ਜ਼ਲ. ਰੁਬਾਈ, ਹਾਇਕੂ, ਨਾਵਲ, ਨਿੱਕੀ ਕਹਾਣੀ, ਨਾਟਕ ਅਤੇ ਇਕਾਂਗੀ, ਨਿਬੰਧ, ਸਫ਼ਰਨਾਮਾ, ਡਾਇਰੀ, ਜੀਵਨੀ, ਸਵੈ-ਜੀਵਨੀ ਅਤੇ ਰੇਖਾ ਚਿੱਤਰ ।
- **ਯੂਨਾਨੀ ਕਾਵਿ ਸ਼ਾਸਤਰ:** ਪਲੈਟੋ, ਅਰਸਤੂ, ਲੌਨਜਾਈਨਸ ।
- **ਭਾਰਤੀ ਕਾਵਿ ਸ਼ਾਸਤਰ:**
  - ਕਾਵਿ ਦੇ ਭੇਦ: ਸ਼੍ਰਵ ਅਤੇ ਦ੍ਰਿਸ਼ ।
  - ਰਸ ਸੰਪ੍ਰਦਾਇ, ਧੁਨੀ ਸੰਪ੍ਰਦਾਇ, ਅਲੰਕਾਰ ਸੰਪ੍ਰਦਾਇ, ਵਕਰੋਕਤੀ ਸੰਪ੍ਰਦਾਇ ।
- **ਪੱਛਮੀ ਸਾਹਿਤ ਚਿੰਤਨ:** ਰੂਪਵਾਦ, ਮਾਰਕਸਵਾਦ, ਸੰਰਚਨਾਵਾਦ, ਮਨੋਵਿਗਿਆਨ, ਚਿਹਨ ਵਿਗਿਆਨ, ਵਿਰਚਨਾ ਸਾਹਿਤ ਸਿਧਾਂਤ, ਨਾਰੀ ਚਿੰਤਨ ਅਤੇ ਉੱਤਰ ਆਧੁਨਿਕ ਸਾਹਿਤ ਸਿਧਾਂਤ ।
- ਪੰਜਾਬੀ ਸਾਹਿਤ ਚਿੰਤਕ : ਸੰਤ ਸਿੰਘ ਸੇਖੋਂ, ਕਿਸ਼ਨ ਸਿੰਘ, ਹਰਿਭਜਨ ਸਿੰਘ, ਨਜ਼ਮ ਹੁਸੈਨ ਸੱਯਦ, ਅਤੇ ਹਰਿਭਜਨ ਸਿੰਘ ਭਾਟੀਆ।
- ਸਾਹਿਤ ਦੀ ਇਤਿਹਾਸਕਾਰੀ: ਸੰਕਲਪ ਅਤੇ ਸਰੂਪ।
- ਸਾਹਿਤ ਇਤਿਹਾਸਕਾਰੀ ਦੌਰਾਨ ਸਾਹਿਤਕ ਤੱਥਾਂ ਦੇ ਨਿਰਨੇ ਦੀਆਂ ਸਮੱਸਿਆਵਾਂ।
- ਸੰਯੁਕਤ ਪੰਜਾਬੀ ਸਾਹਿਤ ਦੀ ਇਤਿਹਾਸਕਾਰੀ: ਕਾਲ ਵੰਡ ਅਤੇ ਵਰਗੀਕਰਨ ਦੀਆਂ ਸਮੱਸਿਆਵਾਂ।
- ਜੰਮੂ ਕਸ਼ਮੀਰ ਦੇ ਪੰਜਾਬੀ ਸਾਹਿਤ ਦੀ ਇਤਿਹਾਸਕਾਰੀ: ਮਹੱਤਵ ਅਤੇ ਲੇਖਣ ਸਮੱਸਿਆਵਾਂ।
- ਜੰਮੂ ਕਸ਼ਮੀਰ ਵਿਚ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀ ਸਥਿਤੀ ਅਤੇ ਸੰਵਿਧਾਨਕ ਸਥਿਤੀ।
- ਜੰਮੂ ਕਸ਼ਮੀਰ ਦੇ ਪ੍ਰਥਮ ਪੰਜਾਬੀ ਸਾਹਿਤਕਾਰ ਬਾਰੇ ਨਿਰਨਾ।
- ਜੰਮੂ ਕਸ਼ਮੀਰ ਦੀ ਪੰਜਾਬੀ ਕਵਿਤਾ ਦਾ ਇਤਿਹਾਸ।
  - ਮੁੱਢਲਾ ਕਾਲ (1600 ਤੋਂ 1850 ਈ.) ਅਧਿਆਤਮਕ ਅਤੇ ਬੀਰਮਸ਼ਾਹੀ ਸੰਤਾਂ ਦੀ ਕਵਿਤਾ।
  - ਮੱਧ ਕਾਲ (1850 ਤੋਂ 1900 ਈ) ਸੂਫ਼ੀ ਕਵਿਤਾ, ਭਗਤੀ ਕਾਵਿ, ਦੁਨਿਆਵੀ ਕਾਵਿ ਅਤੇ ਬੀਰਮਸ਼ਾਹੀ ਸੰਤਾਂ ਦੀ ਕਵਿਤਾ।
  - ਆਧੁਨਿਕ ਕਾਲ (1900 ਤੋਂ ਹੁਣ ਤਕ) ਇਤਿਹਾਸਕ ਪਿਛੋਕੜ ਅਤੇ ਪ੍ਰਮੁੱਖ ਪ੍ਰਵਿਰਤੀਆਂ।
- ਜੰਮੂ ਕਸ਼ਮੀਰ ਦੀ ਪੰਜਾਬੀ ਗਲਪ ਦਾ ਇਤਿਹਾਸਕ ਵਿਕਾਸ ਅਤੇ ਪ੍ਰਮੁੱਖ ਪ੍ਰਵਿਰਤੀਆਂ।
- ਜੰਮੂ ਕਸ਼ਮੀਰ ਦੇ ਪੰਜਾਬੀ ਨਾਟਕ ਅਤੇ ਰੰਗਮੰਚ ਦਾ ਇਤਿਹਾਸਕ ਵਿਕਾਸ।
- ਜੰਮੂ ਕਸ਼ਮੀਰ ਦੀ ਪੰਜਾਬੀ ਵਾਰਤਕ ਦਾ ਇਤਿਹਾਸਕ ਵਿਕਾਸ।

Unit-II **ਪੰਜਾਬੀ ਸੂਫ਼ੀ ਕਾਵਿ ਧਾਰਾ ਅਤੇ ਗੁਰਮਤਿ ਕਾਵਿ ਧਾਰਾ**

- ਪੰਜਾਬੀ ਸੂਫ਼ੀ ਕਾਵਿ ਧਾਰਾ: ਆਰੰਭ, ਵਿਕਾਸ ਪੜਾਅ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਪ੍ਰਮੁੱਖ ਪੰਜਾਬੀ ਸੂਫ਼ੀ ਕਵੀ: ਬਾਬਾ ਫ਼ਰੀਦ, ਸ਼ਾਹ ਹੁਸੈਨ, ਬੁੱਲ੍ਹੇ ਸ਼ਾਹ, ਸੁਲਤਾਨ ਬਾਹੂ ਅਤੇ ਵਜ਼ੀਦ।

- ਗੁਰਮਤਿ ਕਾਵਿ ਧਾਰਾ: ਆਰੰਭ, ਵਿਕਾਸ ਪੜਾਅ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਸ੍ਰੀ ਗੁਰੂ ਗ੍ਰੰਥ ਸਾਹਿਬ: ਸੰਪਾਦਨ-ਕਲਾ ਅਤੇ ਸਾਹਿਤਕ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਪ੍ਰਮੁੱਖ ਗੁਰੂ ਕਵੀ: ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਜੀ, ਗੁਰੂ ਅੰਗਦ ਦੇਵ ਜੀ, ਗੁਰੂ ਅਰਜਨ ਦੇਵ ਜੀ, ਗੁਰੂ ਤੇਗ਼ ਬਹਾਦਰ ਜੀ ਅਤੇ ਗੁਰੂ ਗੋਬਿੰਦ ਸਿੰਘ ਜੀ।
- ਪ੍ਰਮੁੱਖ ਭਗਤ ਕਵੀ: ਰਵੀਦਾਸ, ਨਾਮਦੇਵ ਅਤੇ ਕਬੀਰ।
- ਵਾਰਾਂ ਭਾਈ ਗੁਰਦਾਸ।

Unit-III **ਪੰਜਾਬੀ ਕਿੱਸਾ ਕਾਵਿ ਅਤੇ ਬੀਰ ਕਾਵਿ ਧਾਰਾ**

- ਪੰਜਾਬੀ ਕਿੱਸਾ ਕਾਵਿ ਧਾਰਾ: ਆਰੰਭ, ਵਿਕਾਸ ਪੜਾਅ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਪ੍ਰਮੁੱਖ ਕਿੱਸਾਕਾਰ: ਦਮੋਦਰ, ਪੀਲੂ, ਵਾਰਿਸ, ਹਾਸ਼ਮ ਤੇ ਕਾਦਰਯਾਰ।
- ਪੰਜਾਬੀ ਬੀਰ ਕਾਵਿ ਅਤੇ ਜੰਗਨਾਮਾ ਕਾਵਿ ਧਾਰਾ : ਆਰੰਭ, ਵਿਕਾਸ ਪੜਾਅ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਪ੍ਰਮੁੱਖ ਵਾਰਕਾਰ: ਗੁਰੂ ਗੋਬਿੰਦ ਸਿੰਘ, ਨਜ਼ਾਬਤ ਤੇ ਪੀਰ ਮੁਹੰਮਦ।
- ਪ੍ਰਮੁੱਖ ਜੰਗਨਾਮਾਕਾਰ: ਸ਼ਾਹ ਮੁਹੰਮਦ, ਮਟਕ।

Unit-IV **ਪੰਜਾਬੀ ਵਾਰਤਕ**

- ਮੱਧਕਾਲੀ ਪੰਜਾਬੀ ਵਾਰਤਕ: ਆਰੰਭ, ਵਿਕਾਸ ਪੜਾਅ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ। (ਜਨਮ ਸਾਖੀ ਪਰੰਪਰਾ: ਪੁਰਾਤਨ ਜਨਮ-ਸਾਖੀ, ਆਦਿ ਸਾਖੀਆਂ, ਸ਼ੰਭੂ ਨਾਥ ਵਾਲੀ ਜਨਮ-ਸਾਖੀ, ਮਿਹਰਬਾਨ ਵਾਲੀ ਜਨਮ-ਸਾਖੀ, ਜਨਮ-ਸਾਖੀ ਭਾਈ ਬਾਲਾ; ਗਿਆਨ ਰਤਨਾਵਲੀ, ਗੁਰ ਬਿਲਾਸ, ਰੋਸ਼ਟਾਂ, ਪਰਚੀਆਂ, ਰਹਿਤਨਾਮੇ, ਅਤੇ ਟੀਕੇ ਦੇ ਸੰਦਰਭ ਵਿਚ)
- ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਵਾਰਤਕ: ਆਰੰਭ, ਵਿਕਾਸ ਪੜਾਅ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਸਮਕਾਲੀ ਪੰਜਾਬੀ ਵਾਰਤਕ ਵਿਚ ਨਵੇਂ ਝੁਕਾਅ।
- ਪ੍ਰਮੁੱਖ ਪੰਜਾਬੀ ਵਾਰਤਕਕਾਰ: ਭਾਈ ਵੀਰ ਸਿੰਘ, ਪੂਰਨ ਸਿੰਘ, ਸਾਹਿਬ ਸਿੰਘ, ਤੇਜਾ ਸਿੰਘ, ਗੁਰਬਖ਼ਸ਼ ਸਿੰਘ ਪ੍ਰੀਤਲੜੀ, ਬਲਰਾਜ ਸਾਹਨੀ, ਬਲਵੰਤ ਗਾਰਗੀ, ਕੁਲਬੀਰ ਸਿੰਘ ਕਾਂਗ ਅਤੇ ਨਰਿੰਦਰ ਸਿੰਘ ਕਪੂਰ।

Unit-V **ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਕਵਿਤਾ**

- ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਕਵਿਤਾ: ਆਰੰਭ, ਵਿਕਾਸ ਪੜਾਅ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਕਵਿਤਾ ਵਿਚ ਪ੍ਰਮੁੱਖ ਰੁਝਾਨ (ਆਦਰਸ਼ਵਾਦੀ, ਯਥਾਰਥਵਾਦੀ, ਪ੍ਰਗਤੀਵਾਦੀ, ਪ੍ਰਯੋਗਸ਼ੀਲ, ਜੁਝਾਰਵਾਦੀ, ਨਾਰੀ ਦ੍ਰਿਸ਼ਟੀ ਅਤੇ ਦਲਿਤ-ਦ੍ਰਿਸ਼ਟੀ ਦੇ ਸੰਦਰਭ ਵਿਚ)
- ਸਮਕਾਲੀ ਪੰਜਾਬੀ ਕਵਿਤਾ ਵਿਚ ਨਵੇਂ ਝੁਕਾਅ।
- ਪ੍ਰਮੁੱਖ ਪੰਜਾਬੀ ਕਵੀ: ਭਾਈ ਵੀਰ ਸਿੰਘ, ਪੂਰਨ ਸਿੰਘ, ਧਨੀ ਰਾਮ ਚਾਤ੍ਰਿਕ, ਮੋਹਨ ਸਿੰਘ, ਅੰਮ੍ਰਿਤਾ ਪ੍ਰੀਤਮ, ਬਾਵਾ ਬਲਵੰਤ, ਹਰਿਭਜਨ ਸਿੰਘ, ਜਸਵੰਤ ਸਿੰਘ ਨੇਕੀ, ਸ਼ਿਵ ਕੁਮਾਰ ਬਟਾਲਵੀ, ਪਾਸ਼, ਸੁਰਜੀਤ ਪਾਤਰ ਅਤੇ ਜਸਵੰਤ ਦੀਦ।

Unit-VI **ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਗਲਪ**

- ਪੰਜਾਬੀ ਨਾਵਲ: ਆਰੰਭ, ਵਿਕਾਸ ਪੜਾਅ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਪੰਜਾਬੀ ਨਾਵਲ ਵਿਚ ਪ੍ਰਮੁੱਖ ਰੁਝਾਨ: (ਆਦਰਸ਼ਵਾਦੀ, ਯਥਾਰਥਵਾਦੀ, ਪ੍ਰਗਤੀਵਾਦੀ, ਇਤਿਹਾਸਕ, ਮਨੋਵਿਗਿਆਨਕ, ਨਾਰੀ ਦ੍ਰਿਸ਼ਟੀ ਅਤੇ ਦਲਿਤ-ਦ੍ਰਿਸ਼ਟੀ ਦੇ ਸੰਦਰਭ ਵਿਚ)
- ਸਮਕਾਲੀ ਪੰਜਾਬੀ ਨਾਵਲ ਵਿਚ ਨਵੇਂ ਝੁਕਾਅ।
- ਪ੍ਰਮੁੱਖ ਪੰਜਾਬੀ ਨਾਵਲਕਾਰ: ਨਾਨਕ ਸਿੰਘ, ਜਸਵੰਤ ਸਿੰਘ ਕੰਵਲ, ਗੁਰਦਿਆਲ ਸਿੰਘ, ਦਲੀਪ ਕੌਰ ਟਿਵਾਣਾ, ਰਾਮ ਸਰੂਪ ਅਣਖੀ, ਬਲਦੇਵ ਸਿੰਘ ਸੜਕਨਾਮਾ ਅਤੇ ਮਨਮੋਹਨ ਬਾਵਾ।
- ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਕਹਾਣੀ: ਆਰੰਭ, ਵਿਕਾਸ ਪੜਾਅ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਕਹਾਣੀ ਵਿਚ ਪ੍ਰਮੁੱਖ ਰੁਝਾਨ: (ਆਦਰਸ਼ਵਾਦੀ, ਯਥਾਰਥਵਾਦੀ, ਦੇਸ਼ ਵੰਡ ਨਾਲ ਸਬੰਧਿਤ, ਪ੍ਰਗਤੀਵਾਦੀ, ਮਨੋਵਿਗਿਆਨਕ, ਨਾਰੀ ਦ੍ਰਿਸ਼ਟੀ ਅਤੇ ਦਲਿਤ-ਦ੍ਰਿਸ਼ਟੀ ਦੇ ਸੰਦਰਭ ਵਿਚ)

- ਸਮਕਾਲੀ ਪੰਜਾਬੀ ਕਹਾਣੀ ਵਿਚ ਨਵੇਂ ਝੁਕਾਅ।
- ਪ੍ਰਮੁੱਖ ਪੰਜਾਬੀ ਕਹਾਣੀਕਾਰ: ਸੁਜਾਨ ਸਿੰਘ, ਕਰਤਾਰ ਸਿੰਘ ਦੁੱਗਲ, ਸੰਤ ਸਿੰਘ ਸੇਖੋਂ, ਕੁਲਵੰਤ ਸਿੰਘ ਵਿਰਕ, ਅਜੀਤ ਕੌਰ, ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼, ਵਰਿਆਮ ਸਿੰਘ ਸੰਧੂ ਅਤੇ ਲਾਲ ਸਿੰਘ।

Unit-VII **ਪੰਜਾਬੀ ਨਾਟਕ ਅਤੇ ਇਕਾਂਗੀ**

- ਪੰਜਾਬੀ ਨਾਟਕ ਅਤੇ ਇਕਾਂਗੀ: ਆਰੰਭ, ਵਿਕਾਸ ਪੜਾਅ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਸਮਕਾਲੀ ਪੰਜਾਬੀ ਨਾਟਕ ਵਿਚ ਪ੍ਰਮੁੱਖ ਰੁਝਾਨ।
- ਪ੍ਰਮੁੱਖ ਪੰਜਾਬੀ ਨਾਟਕਕਾਰ ਤੇ ਇਕਾਂਗੀ ਕਾਰ: ਈਸ਼ਵਰ ਚੰਦਰ ਨੰਦਾ, ਸੰਤ ਸਿੰਘ ਸੇਖੋਂ, ਹਰਚਰਨ ਸਿੰਘ, ਬਲਵੰਤ ਗਾਰਗੀ, ਸੁਰਜੀਤ ਸਿੰਘ ਸੇਠੀ, ਚਰਨਦਾਸ ਸਿੱਧੂ, ਅਜਮੇਰ ਔਲਖ, ਆਤਮਜੀਤ ਅਤੇ ਸਵਰਾਜ ਬੀਰ ।
- ਪੰਜਾਬੀ ਰੰਗਮੰਚ: ਆਰੰਭ, ਵਿਕਾਸ ਪੜਾਅ, ਸਮੱਸਿਆਵਾਂ ਅਤੇ ਭਵਿੱਖ ।

Unit-VIII **ਲੋਕਧਾਰਾ ਤੇ ਪੰਜਾਬੀ ਲੋਕਧਾਰਾ ਅਤੇ ਸਭਿਆਚਾਰ ਤੇ ਪੰਜਾਬੀ ਸਭਿਆਚਾਰ**

- ਲੋਕਧਾਰਾ; ਪਰਿਭਾਸ਼ਾ, ਪ੍ਰਕਿਰਤੀ ਤੇ ਤੱਤ।
- ਲੋਕਧਾਰਾ; ਆਧੁਨਿਕਤਾ ਅਤੇ ਸੰਚਾਰ ਮਾਧਿਅਮ।
- ਲੋਕ ਸਾਹਿਤ ਅਤੇ ਵਿਸ਼ਿਸ਼ਟ ਸਾਹਿਤ
- ਲੋਕ ਸਾਹਿਤ: ਸੰਕਲਪ ਅਤੇ ਪ੍ਰਮੁੱਖ ਵੰਨਗੀਆਂ।
- ਲੋਕਧਾਰਾ ਦੀਆਂ ਵਿਭਿੰਨ ਪ੍ਰਗਟਾਅ ਵਿਧੀਆਂ (ਲੋਕ ਗੀਤ, ਲੋਕ ਕਥਾ, ਲੋਕ ਵਿਸ਼ਵਾਸ, ਰੀਤੀ ਰਿਵਾਜ, ਲੋਕ ਨਾਟਕ, ਲੋਕ ਧਰਮ, ਲੋਕ ਕਲਾਵਾਂ ਅਤੇ ਲੋਕ ਨਾਚ)
- ਲੋਕਧਾਰਾ ਵਿਗਿਆਨ ਦੀ ਦ੍ਰਿਸ਼ਟੀ ਤੋਂ ਸਾਹਿਤ ਦਾ ਅਧਿਐਨ।
- ਪੰਜਾਬੀ ਲੋਕਧਾਰਾਈ ਸਮਗਰੀ ਦੇ ਵਿਭਿੰਨ ਰੂਪ ਅਤੇ ਵਰਗੀਕਰਨ।
- ਪੰਜਾਬੀ ਲੋਕ ਵਿਸ਼ਵਾਸ, ਲੋਕ ਸਿਆਣਪਾਂ, ਰੀਤਾਂ-ਰਸਮਾਂ ਅਤੇ ਤਿਉਹਾਰ।
- ਪੰਜਾਬੀ ਲੋਕ-ਕਲਾਵਾਂ, ਲੋਕ-ਨਾਚ ਅਤੇ ਲੋਕ-ਸੰਗੀਤ।
- ਪੰਜਾਬੀ ਲੋਕ ਸਾਹਿਤ ਦਾ ਵਰਗੀਕਰਨ; ਲੋਕ ਗੀਤ, ਲੋਕ ਕਥਾਵਾਂ, ਲੋਕ ਨਾਟ।
- ਪੰਜਾਬੀ ਲੋਕ ਧੰਦੇ, ਲੋਕ ਗਹਿਣੇ, ਲੋਕ ਪਹਿਰਾਵਾ ਅਤੇ ਲੋਕ ਖੇਡਾਂ।
- ਪੰਜਾਬੀ ਦੇ ਪ੍ਰਸਿੱਧ ਲੋਕਧਾਰਾ ਵਿਗਿਆਨੀਆਂ ਦਾ ਯੋਗਦਾਨ (ਆਰ.ਸੀ. ਟੈਂਪਲ, ਦਵਿੰਦਰ ਸਤਿਆਰਥੀ, ਸ.ਸ. ਵਣਜਾਰਾ ਬੇਦੀ, ਮਹਿੰਦਰ ਸਿੰਘ ਰੰਧਾਵਾ, ਕਰਨੈਲ ਸਿੰਘ ਥਿੰਦ ਅਤੇ ਨਾਹਰ ਸਿੰਘ)।
- ਸਭਿਆਚਾਰ: ਪਰਿਭਾਸ਼ਾ, ਸਰੂਪ ਤੇ ਤੱਤ।
- ਸਭਿਆਚਾਰ ਅਤੇ ਸਭਿਅਤਾ ਦਾ ਅੰਤਰ-ਨਿਖੇੜ
- ਸਭਿਆਚਾਰਕ ਰੂਪਾਂਤਰਨ ਪ੍ਰਕ੍ਰਿਆ।
- ਸਭਿਆਚਾਰ, ਸਮਾਜ ਅਤੇ ਭਾਸ਼ਾ ਦਾ ਅੰਤਰ-ਸਬੰਧ।
- ਸਭਿਆਚਾਰ ਅਧਿਐਨ ਦੀਆਂ ਵਿਭਿੰਨ ਦ੍ਰਿਸ਼ਟੀਆਂ।
- ਸਭਿਆਚਾਰ ਦਾ ਭੂਗੋਲ, ਆਰਥਿਕਤਾ, ਧਰਮ ਅਤੇ ਰਾਜਨੀਤੀ ਨਾਲ ਸੰਬੰਧ।
- ਲੋਕਧਾਰਾ ਅਤੇ ਸਭਿਆਚਾਰ ਦਾ ਅੰਤਰ-ਨਿਖੇੜ।
- ਪੰਜਾਬ, ਪੰਜਾਬੀ ਅਤੇ ਪੰਜਾਬੀ ਸਭਿਆਚਾਰ।
- ਪੰਜਾਬੀ ਸਭਿਆਚਾਰ ਦੇ ਪਛਾਣ ਚਿੰਨ੍ਹ।
- ਪੰਜਾਬੀ ਸਭਿਆਚਾਰ ਉੱਪਰ ਭਾਰਤੀ ਤੇ ਸਾਮੀ ਸਭਿਆਚਾਰ ਦਾ ਪ੍ਰਭਾਵ।
- ਪੰਜਾਬੀ ਸਭਿਆਚਾਰ ਅਤੇ ਸਾਕਾਦਾਰੀ ਪ੍ਰਬੰਧ।
- ਵਿਸ਼ਵੀਕਰਨ ਦੇ ਦੌਰ ਵਿਚ ਪੰਜਾਬੀ ਸਭਿਆਚਾਰ ਸਨਮੁਖ ਚੁਨੌਤੀਆਂ।
- ਪ੍ਰਸਿੱਧ ਪੰਜਾਬੀ ਸਭਿਆਚਾਰ ਸ਼ਾਸਤਰੀਆਂ ਦਾ ਯੋਗਦਾਨ (ਟੀ.ਆਰ. ਵਿਨੋਦ, ਗੁਰਬਖ਼ਸ਼ ਸਿੰਘ ਫਰੈਂਕ ਅਤੇ ਜਸਵਿੰਦਰ ਸਿੰਘ) ।

Unit-IX **ਭਾਸ਼ਾ, ਭਾਸ਼ਾ ਵਿਗਿਆਨ, ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਗਿਆਨ ਅਤੇ ਗੁਰਮੁਖੀ ਲਿਪੀ**

- ਭਾਸ਼ਾ : ਪਰਿਭਾਸ਼ਾ, ਸਰੂਪ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਭਾਸ਼ਾ, ਸਮਾਜ, ਸਭਿਆਚਾਰ ਅਤੇ ਸਾਹਿਤ ਦਾ ਅੰਤਰ-ਸਬੰਧ
- ਭਾਸ਼ਾ, ਉਪਭਾਸ਼ਾ ਅਤੇ ਲਿਪੀ ਦਾ ਅੰਤਰ-ਨਿਖੇੜ।
- ਭਾਸ਼ਾ ਅਤੇ ਸੰਚਾਰ ਮਾਧਿਅਮ (ਪ੍ਰਿੰਟ, ਇਲੈਕਟ੍ਰਾਨਿਕ ਅਤੇ ਨਿਊ ਮੀਡੀਆ)।
- ਵਿਸ਼ਵ ਭਾਸ਼ਾ ਪਰਿਵਾਰ। ਆਧੁਨਿਕ ਭਾਰਤੀ ਆਰੀਆ ਭਾਸ਼ਾਵਾਂ।
- ਭਾਸ਼ਾ ਵਿਗਿਆਨ : ਪਰਿਭਾਸ਼ਾ, ਸਰੂਪ ਤੇ ਖੇਤਰ।
- ਸਾਸਿਓਰ ਦੇ ਭਾਸ਼ਾਈ ਸੰਕਲਪ: ਚਿਹਨ, ਚਿਹਨਕ ਤੇ ਚਿਨਹਤ, ਲੈਂਗ ਤੇ ਪੈਰੋਲ, ਇਕਾਲਕ ਤੇ ਦੁਕਾਲਕ, ਕੜੀਦਾਰ ਤੇ ਲੜੀਦਾਰ।
- ਨੌਮ ਚੌਮਸਕੀ ਦੇ ਭਾਸ਼ਾਈ ਸੰਕਲਪ: ਯੋਗਤਾ ਤੇ ਨਿਭਾਓ, ਗਹਿਨ ਤੇ ਸਤਹੀ ਜੁਗਤ, ਵਾਕਾਂਸ਼ ਉਸਾਰੀ ਨੇਮ, ਰੂਪਾਂਤਰੀ ਨੇਮ ਧੁਨੀ ਰੂਪਾਤਮਿਕ ਨੇਮ।
- ਧੁਨੀ ਤੇ ਧੁਨੀ ਵਿਗਿਆਨ: ਸੰਕਲਪ ਤੇ ਵਰਗੀਕਰਨ।
- ਭਾਵਾਂਸ਼/ਰੂਪੀਮ ਤੇ ਭਾਵਾਂਸ਼/ਰੂਪੀਮ-ਪ੍ਰਬੰਧ: ਸੰਕਲਪ ਤੇ ਵਰਗੀਕਰਨ।
- ਵਾਕ ਅਤੇ ਵਾਕ ਵਿਗਿਆਨ: ਸੰਕਲਪ ਤੇ ਵਰਗੀਕਰਨ।
- ਅਰਥ ਅਤੇ ਅਰਥ ਵਿਗਿਆਨ: ਸੰਕਲਪ ਤੇ ਵਰਗੀਕਰਨ।
- ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦਾ ਆਰੰਭ, ਵਿਕਾਸ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਉੱਪਰ ਹੋਰ ਭਾਸ਼ਾਵਾਂ ਦੇ ਪ੍ਰਭਾਵ।
- ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀਆਂ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਪੰਜਾਬੀ ਦੀਆਂ ਉਪਭਾਸ਼ਾਵਾਂ।
- ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੇ ਵਿਕਾਸ ਅਦਾਰੇ।
- ਪੰਜਾਬੀ ਭਾਵਾਂਸ਼/ਰੂਪੀਮ-ਵਿਗਿਆਨ/ਵਿਉਂਤ।
- ਪੰਜਾਬੀ ਵਾਕ-ਵਿਗਿਆਨ/ਵਿਉਂਤ।
- ਪੰਜਾਬੀ ਅਰਥ-ਵਿਗਿਆਨ/ਵਿਉਂਤ।
- ਗੁਰਮੁਖੀ ਲਿਪੀ ਦਾ ਨਿਕਾਸ, ਵਿਕਾਸ ਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।
- ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਤੇ ਗੁਰਮੁਖੀ ਲਿਪੀ ਦਾ ਅੰਤਰ ਸੰਬੰਧ।
- ਪ੍ਰਮੁੱਖ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਗਿਆਨੀ (ਹਰਕੀਰਤ ਸਿੰਘ, ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼ ਸਿੰਘ ਅਤੇ ਪਰਮਜੀਤ ਸਿੰਘ ਸਿੱਧੂ)।

Unit-X **ਫ਼ੁਟਕਲ (ਪਰਵਾਸ, ਅਨੁਵਾਦ ਅਤੇ ਖੋਜ ਵਿਗਿਆਨ)**

- ਪਰਵਾਸ: ਪਰਿਭਾਸ਼ਾ, ਸਰੂਪ ਤੇ ਤੱਤ।
- ਡਾਇਸਪੋਰਾ ਅਤੇ ਪਰਵਾਸ: ਅੰਤਰ-ਨਿਖੇੜ।
- ਬਹੁ ਸਭਿਆਚਾਰਵਾਦ: ਸੰਕਲਪ ਤੇ ਸਰੂਪ।
- ਪੰਜਾਬੀ ਪਰਵਾਸ: ਇਤਿਹਾਸ, ਮਸਲੇ ਅਤੇ ਵੰਗਾਰਾਂ।
- ਅਨੁਵਾਦ: ਪਰਿਭਾਸ਼ਾ, ਸਰੂਪ ਤੇ ਤੱਤ।
- ਅਨੁਵਾਦ ਦੀਆਂ ਕਿਸਮਾਂ।
- ਅਨੁਵਾਦ ਦੀ ਮਹਤਤਾ।
- ਅਨੁਵਾਦ ਅਤੇ ਮਸ਼ੀਨ ਅਨੁਵਾਦ।
- ਕਾਵਿ ਅਨੁਵਾਦ ਦੀਆਂ ਸਮੱਸਿਆਵਾਂ।
- ਦੋ-ਭਾਸ਼ੀਆ ਦਾ ਰੋਲ।
- ਅਨੁਵਾਦ ਅਤੇ ਮੀਡੀਆ।
- ਖੋਜ: ਪਰਿਭਾਸ਼ਾ, ਸਰੂਪ ਤੇ ਤੱਤ।

- ਖੋਜ ਵਿਧੀ ਦੇ ਸੰਦ।
- ਖੋਜ ਅਤੇ ਆਲੋਚਨਾ: ਅੰਤਰ-ਨਿਖੇੜ।
- ਖੋਜ-ਵਿਧੀਆਂ।
- ਖੋਜ-ਨਿਖੰਧ ਅਤੇ ਸ਼ੋਧ-ਪ੍ਰਬੰਧ: ਅੰਤਰ-ਨਿਖੇੜ।
- ਖੋਜ ਅਤੇ ਇੰਟਰਨੈਟ ਸਮਗਰੀ।
- ਖੋਜ ਅਤੇ ਡਿਜੀਟਲ ਲਾਇਬ੍ਰੇਰੀ।
- ਪੰਜਾਬੀ ਖੋਜ ਦੀਆਂ ਪ੍ਰਾਪਤੀਆਂ ਤੇ ਨਵੀਨ ਸੰਭਾਵਨਾਵਾਂ।
- ਪੰਜਾਬੀ ਖੋਜ-ਪਰੰਪਰਾ।

J&K PUBLIC SERVICE COMMISSION

SYLLABUS FOR THE WRITTEN TEST IN SUBJECT DOGRI

UNIT - I

भाशा ते भाशाविज्ञान

- भाशा दी परिभाशा, म्हत्तव ते इसदा रूप-सुआत्म। भाशा दे बक्ख-बक्ख रूप : वाक, बोल्ली, भाशा, राश्ट्रभाशा, सम्पर्क भाशा आदि।
- भाशा विज्ञान दा म्हत्तव, शाखां, होरनें विशें ते विज्ञानें कन्नै सरबंध ते उसदे उपयोग। प्राचीन काल थमां लेइयै बीहमीं सदी दे खीर तक दा भाशाविज्ञान दा इतिहास-- खास तौरा पर डोगरी दे भाशाविज्ञानक अध्ययन दे संदर्भ च।
- भाशाएं दा परिवारक वर्गीकरण-- भारोपीय भाशा परिवार दे विशेश संदर्भ च। परिवारक वर्गीकरण च डोगरी दा थाहर - बक्ख-बक्ख मतें दे परिप्रेक्ष च।
- डोगरी भाशा दियां विशेशतां ते खेतर विस्तार।
- डोगरी भाशां दा शब्द भंडार।
- डोगरी ध्वनि ते ध्वनिग्राम विज्ञान। डोगरी दी ध्वनि व्यवस्था।
- डोगरी रुप-विज्ञान ते रुपग्राम विज्ञान।
- डोगरी वाक्य-विज्ञान।
- डोगरी अर्थ विज्ञान।
- कोशविज्ञान दी परिभाशा, कोश-निर्माण दी प्रक्रिया ते पद्धति। बक्ख-बक्ख चाल्ली दे कोश ते उंदा प्रयोग।

UNIT - II

डोगरी व्याकरण ते लिपि

- डोगरी च संज्ञा, सर्वनामः लिंग, वचन ते कारक दे अधार उप्पर रूपायन।
- डोगरी विशेशनः लिंग, वचन ते कारक दे अधार उप्पर रूपायन। डोगरी च विशेशन बनाने दे नियम।
- डोगरी क्रिया: वाच्य, काल, अर्थ, लिंग, वचन ते पुरश दे अधार उप्पर रूपायन।
- डोगरी च सधारण क्रिया, संयुक्त क्रिया, प्रेरणार्थक क्रिया ते नामधातु।
- डोगरी च अव्ययः क्रियाविशेशन, संबंधबोधक, समुच्चयबोधक, विस्मयबोधक।
- लिपि विज्ञान :
    - डोगरी लिपि दा रम्भ ते विकास
    - पराने डोगरे अक्खर ते नमें डोगरे अक्खर
    - देवनागरी लिपि च डोगरी लेखन
    - डोगरी भाशा दे सुआत्म अनुसार देवनागरी लिपि च अपनाए गेदे चेचे धुवे।

UNIT - III

डोगरी कविता दे बक्ख-बक्ख रूप

- सन् 1980 तगर दी डोगरी कविता दा रम्भ ते विकास।
- डोगरी कविता दे बक्ख-बक्ख रूपें-- स्वछंद कविता, छंदोबद्ध कविता, गीत, लम्मी कविता, ग़ज़ल, चमुखे, सॉन्नेट, दोहे, कुंडली आदि दा अध्ययन।
- हेठ लिखे दे कवियें दी कविता दा विशेश अध्ययनः
  के. एस.मधुकर, यश शर्मा, पद्मा सचदेव, मोहन लाल सपोलिया, तारा स्मैलपुरी, कुंबर वियोगी, प्रकाश प्रेमी, चम्पा शर्मा, अश्विनी मंगोत्रा, शम्भूनाथ शर्मा, अभिशाप, ज्ञानेश्वर, दर्शनदर्शी ।

- सन् 1980 दे बाद दी डोगरी कविता दे प्रमुख रुझानें दा अध्ययन: भगतीवादी, सुधारवादी, श्रृंगारवादी, राश्ट्रवादी, हास्य-व्यंगवादी, प्रगतिवादी।
- डोगरी महाकाव्य दा रम्भ ते विकास ते डोगरी महाकाव्य रामायण,बेद्दन धरती दी, जित्तो ते महात्मा विदुर दा विशशे अध्ययन।
- डोगरी खंड काव्य ते निबिंध काव्य दा विशेश अध्ययन।
- डोगरी गज़ल दी विकास यात्रा ते डोगरी दे गज़लगो शायरें : रामनाथ शास्त्री, वेदपाल 'दीप', किश्न स्मैलपुरी, रामलाल शर्मा, शिवराम 'दीप',जितेन्द्र उधमपुरी ते वीरेन्द्र केसर दियें गज़लें दा विशेश अध्ययन।

UNIT - IV

डोगरी क्हानी

- सन् 1980 तगर दी डोगरी क्हानी दी विकास यात्रा।
- डोगरी क्हानी दे विशेगत रुझान : आदर्शवादी, यथार्थवादी, प्रगतिवादी, आधुनिकतावादी, मनोवादी
- सन् 1980 दे बाद दी डोगरी क्हानी दी विकास यात्रा।
- डोगरी-क्हानी दे शैलीगत रुझान : प्रतीकात्मक शैली, डायरी शैली, चिट्ठी -पत्तरी शैली, व्यंगात्मक शैली, मनोविज्ञानिक शैली, आत्मकथात्मक शैली।
- हेठ दित्ते गेदे क्हानीकारें दे क्हानी-साहित्य दा अध्ययन :
  बी.पी. साठे, मदन मोहन शर्मा, नरेन्द्र खजूरिया, ओम गोस्वामी, बंधु शर्मा, कृष्णा प्रेम, शिव मैहता, शिवदेव सुशील,ओम विद्यार्थी,राजराही, जगदीप दुबे

UNIT - V

डोगरी उपन्यास

- सन् 1980 तगर दे डोगरी उपन्यास दी विकास यात्रा।

- डोगरी उपन्यासें दे बक्ख-बक्ख रूझानें दा अध्ययन : समाजिक, राजनैतिक, सुधारवादी, प्रगातिवादी।
- सन् 1980 दे बाद दे डोगरी उपन्यासें दी विकास यात्रा।
- हेठ दित्ते गेदे डोगरी उपन्यासकारें दे उपन्यासें दा विशेश अध्ययन:
  वेद राही, ओ. पी. शर्मा 'सारथी', नरसिंह देव जम्वाल, देशबंधु डोगरा "नूतन", इन्दरजीत केसर, ओम गोस्वामी , तारा दानपुरी, शैलेन्द्र सिंह
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UNIT - VI

डोगरी गद्य

- डोगरी गद्य दी विकास यात्रा।
- डोगरी साहित्य च निबंध-लेखन दा इतिहास।
- निबंध दी परिभाशा, तत्व ते भेद ते डोगरी निबंध साहित्य दा अध्ययन।
- रेखाचित्र दी परिभाशा ते तत्व ते डोगरी रेखाचित्र साहित्य दा अध्ययन।
- जीवनी दी परिभाशा ते तत्व ते डोगरी जीवनी साहित्य दा अध्ययन ।
- संस्मरण दी परिभाशा ते तत्व ते डोगरी संस्मरण साहित्य दा अध्ययन।
- आत्मकथा दी परिभाशा ते तत्व ते डोगरी आत्मकथा साहित्य दा अध्ययन।
- यात्रालेख दी परिभाशा ते तत्व ते डोगरी यात्रालेख साहित्य दा अध्ययन।
- हेठ दित्ते गेदे गद्य लेखकें दे लेखन दा अध्ययन :
  शक्ति शर्मा, विश्वनाथ खजूरिया, लक्ष्मी नारायण, नीलाम्बर देव शर्मा, चम्पा शर्मा, नरसिंह देव जम्वाल, ओम विद्यार्थी।

UNIT - VII

डोगरी नाटक ते एकांकी

- सन् 1980 तगर दे डोगरी रंगमंची नाटकें ते रेडियो नाटकें दी विकास यात्रा।
- सन् 1980 दे बाद दे डोगरी रंगमंची नाटकें ते रेडियो नाटकें दी विकास यात्रा।
- सन् 1980 तगर दे डोगरी एकांकियें दा आलोचनात्मक इतिहास।
- सन् 1980 दे बाद दे डोगरी एकांकियें दा आलोचनात्मक इतिहास।
- डोगरी च नुक्कड़ नाटक लेखन दा इतिहास ते डोगरी नुक्कड़ नाटकें दा विशेश अध्ययन।
- डोगरी नाटक ते एकांकियें दे प्रमुख रुझान : यथार्थवादी, सुधारवादी, परम्परावादी, प्रगतिवादी
- हेठ दित्ते गेदे नाटककारें दे नाट्यरूपें दा विशेश अध्ययन :
  विश्वनाथ खजूरिया, दीनू भाई पंत, रामनाथ शास्त्री, मदन मोहन शर्मा, नरसिंह देव जम्वाल, जितेन्द्र शर्मा, मोहन सिंह, रतन दोषी ।

UNIT - VIII

साहित्य-आलोचना ते डोगरी साहित्य

- साहित्य-आलोचना दे छें भारती संप्रदायें दा अध्ययन : रस, अलंकार, रीति, वक्रोक्ति, ध्वनि, औचित्य।
- भारती आलोचना दे सिद्धांते दा डोगरी साहित्य-आलोचना च प्रयोग : कविता -साहित्य दे संदर्भ च, कथा -साहित्य दे संदर्भ च, नाटक -साहित्य दे संदर्भ च।
- साहित्य-आलोचना दे पच्छमी आलोचना- सिद्धांतें दा अध्ययन : यथार्थवाद सिद्धांत, आदर्शवाद सिद्धांत, आधुनिकतावाद सिद्धांत, उत्तराधुनिकतावाद सिद्धांत, अभिव्यंजनावाद सिद्धांत।
- डोगरी साहित्य आलोचना च उप्पर दित्ते दे पच्छमी आलोचना-सिद्धांते दा प्रयोग : कविता - साहित्य दे संदर्भ च, कथा -साहित्य दे संदर्भ च, नाटक -साहित्य दे संदर्भ च।

- हेठ दित्ते दे आलोचकें दे आलोचना - कम्में दा अध्ययन :
  नीलाम्बर देव शर्मा, लक्ष्मी नारायण, रामनाथ शास्त्री, शिवनाथ, चम्पा शर्मा, वीणा गुप्ता, ओम गोस्वामी।

UNIT - IX

लोक-साहित्य ते संस्कृति ते लोक-कलां

- संस्कृति दी परिभाशा ते मूल तत्व, संस्कृति ते सभ्यता च फर्क भेद।
- डुग्गर संस्कृति दी पंछान ते विशेशतां।
- लोक-साहित्य ते लोक-कला दी परिभाशा, लोक साहित्य ते लोक-कला दियां प्रमुख विशेशतां।
- लोक-साहित्य दे भेद: लोक-गीत, लोक-कत्थां, लोक-गाथा, मुहावरे, खुआन ते बझारतां।
- लोक-साहित्य ते शिश्ट-साहित्य च फर्क-भेद, लोक-कला ते आधुनिक कला च अन्तर।
- लोक-गीत : लोकगीत दी परिभाशा, प्रमुख विशेशतां ते लोकगीतें दे भेद : डोगरी लोकगीतें दे विशेश संदर्भ च।
- लोक-कत्थां : लोककत्थ दी परिभाशा, प्रमुख विशेशंतां ते लोककत्थें दे भेद डोगरी लोककत्थें ते विशेश संदर्भ च।
- लोक-गाथा : लोकगाथा दी परिभाशा, प्रमुख विशेशतां ते लोकगाथा दे भेद डोगरी लोकगाथा दे विशेश संदर्भ च।
- लोक-कलां : लोकनाच ते डुग्गर दे लोकनाच, लोक चित्रकला ते डुग्गर दी लोक चित्रकला, लोक मूर्तिकला ते डुग्गर दी लोक मूर्तिकला, लोक संगीत कला ते डुग्गर दी लोक संगीत कला।

UNIT - IX

अनुवाद ते डोगरी च अनूदित साहित्य

- अनुवाद दी परिभाशा, म्हत्ता, भेद ते शैलियां।
- डोगरी च अनूदित साहित्य दा इतिहास ते अनूदित साहित्यक कृतियें दा अध्ययन :
    - अनूदित काव्य कृतियें दा अध्ययन
    - अनूदित कथा कृतियें दा अध्ययन
    - अनूदित नाटकें दा अध्ययन
    - अनुदित गद्य कृतियें दा अध्ययन
- श्रीमद्भगवत गीता दे डोगरी अनुवाद : विशेश अध्ययन
- साहित्यक कृतियें दे अनुवाद सरबंधी समस्यां
    - काव्य अनुवाद सरबंधी समस्यां
    - कथा अनुवाद सरबंधी समस्यां
    - नाटक अनुवाद सरबंधी समस्यां
    - दफ्तरी अनुवाद सरबंधी समस्यां
    - पत्रकारिता च अनुवाद दी म्हत्ता।
- हेठ दित्ते गेदे अनुवादकें दे अनुवादें दा विशेश अध्ययन :
  श्याम लाल शर्मा, रामनाथ शास्त्री, विश्वनाथ खजूरिया, पद्मा सचदेव, चम्पा शर्मा, वीणा गुप्ता, जितेन्द्र शर्मा, ओम गोस्वामी।

SYLLABUS

Home Science

Unit 1:

Food Science & Food Service Management

1.Concept of Food science & nutrition.
2. Properties of food (physical and chemical properties).
3. Quality evaluation of foods – Its objectives and subjective perspectives.
4. Effects of cooking & processing techniques on nutritional components.
5. Food additives & pigments.
6. Food Standards and microbiological safety of food.
7. Perspectives of food service: Menu planning and food cost analysis.
8. Foodservice management of institutional level-hospital, and educational, social & special institutions.

Unit 2:

Nutrition & Dietetics

1. Food groups: Balanced diet, food pyramid, macro & micro nutrition.
2. Nutrients: Role of nutrients, nutrient deficiencies & requirements of nutrients for Indians.
3. Public health nutrition.
4. Nutrition through the life span-physiological changes, nutritional needs, and dietary guidelines for adequate nutrition.
5. Community, Sports nutrition & nutrition at the time of emergencies and disasters.
6. Nutritional assessment methods & techniques.
7. Nutritional intervention: National nutrition policies and programs & food and nutrition security.
8. Therapeutic nutrition.
9. Diet counseling & management.

Unit 3:

Textiles

1. Different Textile terminologies: Fibre, yarn, weave, fabric, Classification and identification of fibers, yarns & weaves.
2. Manufacturing process of major natural & manmade fibers.
3. Methods of fabric construction: Woven, Knitted, and non-woven fabrics: Its properties & uses.
4. Textiles finish Classification, processing & purposes of finishes.
5. Dyeing & printing: block printing, tie, and dye, batik, roller printing, screen printing, heat transfer printing & digitized printing : it's Classification and Method
6. Traditional Indian textiles: Embroidered, Printed textiles, woven textiles, and their identification based on fiber content, technique, and motif.
7. Techniques of testing fibers, yarn, fabrics, and garments.
8. Testing of color: Fastness, shrinkage, pilling, and GSM of fabrics.

Unit 4:

Apparel Designing

1. Body measurements: Procedure, figure types & anthropometry.
2. Equipment & Tools used for manufacturing garments: Types of machines used & their parts.
3. Elements and principles of design & applications to apparel design.
4. Fashion: Terminologies, fashion cycle
   Factors affecting fashion.
5. Pattern making: Drafting, Draping & flat pattern-making techniques.
6. Apparel Quality testing: Quality standards & their specification, Quality parameters, and defects of fabrics and garments.
7. Care and maintenance of clothing: Principles of washing, laundry agents, and storage techniques case labels, and symbols.
8. Selection of clothing & Fabrics for different age groups.

Unit 5:

Resource Management & Consumer Issues

1. Management: Concept, Approaches, Management of time, energy, money & space. Functions of management: Various Processes like Planning, Supervision, Controlling, Organizing, Evaluation, and Use of different resources.
2. Resources: Classification, characteristics, factors affecting use, resource conservation, time management, work simplification techniques, classes of change, and fatigue.
3. Management of natural resources: land, forest, water, air, water harvesting, municipal solid waste management, the concept of sustainable development & its goals.
4. Money management: Family income, types, supplementation, budgeting, household accounts, family savings and investment, tax implications.
5. Human resource management: Functions, challenges, training methodologies & training evaluation.
6. Consumer: Definition, role, rights, and responsibilities, consumer behavior, consumer problems, education & empowerment.
7. Consumer protection: Organizations, redressal platforms, standardization, standard marks, quality control, buying aids, consumer legislation.
8. Entrepreneurship: Concept, Process, barriers, entrepreneurial motivation, challenges, enterprise setting, project planning, appraisal, etc

Unit 6:

Housing & Interior Design

1. Design fundamentals: Elements of art, principles of design & composition.
2. Color: Dimensions of color, psychological effects of color, color schemes, and Factors affecting the use of color.
3. Space planning & design-housing: Need, principles of planning spaces, types of house plans, an economy in construction, planning for different income groups.
4. Building regulations: Norms and standards, zoning, housing for special groups and areas, and housing finance.
5. Housing & Environment: Building materials and their impact on the environment, green rating systems, energy efficiency in buildings, energy auditing, indices of indoor comfort.
6. Energy as a resource: Conventional & non-conventional sources, renewable/non-renewable energy, energy management, and National efforts on energy conservation..

7. Ergonomics: Significance, scope, anthropometry, environment relationship, factors affecting the physiological cost of work, time and motion study, energy studies.
8. Furniture and furnishing: Historical perspectives, architectural styles, contemporary tends, wall finishes, and window treatments.

Unit 7:

Child/Human Development

1. Principles of growth & development, Theories of human development
2.Development during prenatal, postnatal & neonatal period.
3. Early years: An overview of developmental domains. Importance of early years. Early childhood care & education: Activities to promote holistic development.
4. Middle childhood: Developmental changes
5. Children with special needs, care, education, and prevention of disabilities & rehabilitation. Children in difficult circumstances
6. Adolescence/Youth: Changes, Challenges, and Programs to promote their optimal development.
7. Adulthood: Characteristics, changing roles, responsibilities in early & middle adulthood.
8. Aging-physical and psychological changes.

Unit 8:

Family Studies

1. Dynamics of marriage & family relationships.
2. Family welfare: Approaches, programs and challenges, and role in national development.
3. Issues: Domestic violence, marital disharmony, conflict, resolution of conflict.
4. Parent education, positive parenting, community education, Family disorganization, etc.
5. Family studies: Crisis in a family, family therapy, and Initiatives for the development of children.
6. Human rights: Rights of children, women, and the status of women, gender roles.
7. Guidance and counseling across the whole life span.
8. Health & well-being across life span development.

Unit 9:

Communication for Development

1. Communication Basics: Nature, characteristics, functions, process, models, elements, principles, barriers, types of communication, levels of communication transactions, and the process of listening.
2. Communication systems and theories: Human interaction, Mass communication, Message design, Communication systems.
3. Concept of development: Theories, Models, measurement & indicators of development, Communication models & approaches, diffusion, and innovation, etc.
4. Role of communication in development: Its need & importance, development journalism, writing for development including print, radio, television, and internet.
5. Concerns of development communication: Gender, Health, Environment, tribal development, etc.
6. Traditional, modern, and new media for development: Folk forms of songs, art, dance, theatre, puppetry, advertisement, and cinema.
7. ICTs for development: Sources such as the community and participatory video, social media, and mobile phones.
8. Organization/agencies/institutes working for development communication (international/National).

Unit 10:

Extension Management & Community Development

1. Historical perspectives of extension including the objectives of extension education and principles of extension program development.
2. Program management: Assessment, situation analysis, planning, organization, implementation, monitoring & evaluation.
3. Extension methods and materials: Interpersonal, small, and large group methods, planning, classification, use, and evaluation of audio-visual materials.
4. Non-Formal, adult & lifelong education: Historical perspectives, concept, theories, approaches, scope, methods, and materials used and different challenges.
5. Methods of training, and entrepreneurship development.
6. Community development: Perspectives, approaches, community organization, leadership, support structures for community development, including Panchayati Raj NGOs and community-based organizations.
7. People's participation and stakeholders' perspectives: Different methods.
8. Development programs for urban, rural, and tribal population groups in India cover the programs for nutrition, health, education, wage, etc.

Unit 11

Research Methods and Statistics

1. Research methods: Fundamental issues, concept, scope & Research Ethics.
2. Research designs, principles & purpose of research. Types of research: Descriptive, survey, historical, qualitative, quantitative, analytical & action research.
3. Hypothesis testing and types.
4. Sampling techniques: Types procedures, probability & non-probability sampling.
5. Research methods: Selection & preparation of tools for data collection including a questionnaire, interview, observation, measuring scales, ranking, and measurement, reliability with a validity of tools. Types of variables and their selection.
6. Data collection and classification, coding, tabulation, inferential and descriptive statistics.
7. Analysis of data through two different tests parametric and non-parametric tests.
8. Scientific report writing, presentation of data, interpretation & discussion

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR MUSIC

SYLLABUS FOR MUSIC

(Vocal and Instrumental)

Unit-I

Technical Terms:

Sangeet, Nada: ahata & anahata , Shruti & its five jaties, Seven Vedic Swaras, Seven Swaras used in Gandharva, Suddha & Vikrit Swara, Vadi- Samvadi, Anuvadi-Vivadi, Saptak, Aroha, Avaroha, Pakad / vishesa sanchara, Purvanga, Uttaranga, Audava, Shadava, Sampoorna, Varna, Alankara, Alapa, Tana, Gamaka, Alpatva-Bahutva, Graha, Ansha, Nyasa, Apanyas, Avirbhav,Tirobhava, Geeta; Gandharva, Gana, Marga Sangeeta, Deshi Sangeeta, Kutapa, Vrinda, Vaggeyakara Mela, Thata, Raga, Upanga ,Bhashanga ,Meend, Khatka, Murki, Soot, Gat, Jod, Jhala, Ghaseet, Baj, Harmony and Melody, Tala, laya and different layakari, common talas in Hindustani music, Sapta Talas and 35 Talas, Taladasa pranas, Yati, Theka, Matra, Vibhag, Tali, Khali, Quida, Peshkar, Uthaan, Gat, Paran, Rela, Tihai, Chakradar, Laggi, Ladi, Marga-Deshi Tala, Avartana, Sama, Vishama, Atita, Anagata, Dasvidha Gamakas, Panchdasa Gamakas ,Katapayadi scheme, Names of 12 Chakras, Twelve Swarasthanas, Niraval, Sangati, Mudra, Shadangas , Alapana, Tanam, Kaku, Akarmatrik notations.

Unit-II

Folk Music

Origin, evolution and classification of Indian folk song / music.
Characteristics of folk music.
Detailed study of folk music, folk instruments , Folk Dance and performers of Jammu and Kashmir regions.
Ragas and Talas used in folk music Folk fairs & festivals in India.
Art and Culture of Jammu and Kashmir.

Unit-III

Rasa and Aesthetics:

Rasa, Principles of Rasa according to Bharata and others. Rasa nishpatti and its application to Indian Classical Music.

Bhava and Rasa Rasa in relation to swara, laya, tala, chhanda and lyrics.
Aesthetics according to Indian and western Philosophers.
General knowledge of 64 kalas according to Vatsyayan General history of Raga-Ragini Paintings and Raga Dhayana. Interrelation of Fine Arts.

Unit-IV

Research Methodology and Pedagogy, Avenues, Interdisciplinary aspects and Modern Technology:

Research Pedagogy: Research areas, review of literature, selection of suitable research topics and research problems, Methodology of Music research, Preparing synopsis, Data collection and its sources, Analysis of data collection, Writing project report, Research project Indexing, references and bibliography etc. Research Avenues and its Interdisciplinary aspects: Music and Literature, Music Therapy, Philosophy, Psychology, Physics, Mathematics, Economics, Social Sciences, Religion and Culture. Modern Technology: Electronic equipments, computer, internet etc.
New trends in Indian Music in post-independence era.

Unit-V

Applied Theory:

Detail study of Sangeet Utpatti; Musical scales (Indian and western); Detail study of Gram, Murchchhana and Chatussarna; Jaati Lakshana, Jaati Bhed, concept of Raag, Raag-Lakshan. Classification of Raag: 1) Gram Raag and Deshi Raag Classification 2) Male Raag classification 3) Thaat Raag classification 4) Shuddha, Chhayalag and Sankeerna Raag classification 5) Raag-Raagini classification 6) Raagang classification; Time theory of Raagas; Placement of shuddha and vikrit swaras on shruties in Ancient, Medieval and Modern Period; Description of popular Raagas and Taalas; Notation systems of Hindustani, Karnataka and Western Music; Merits and demerits of a vocalist (Gayak); Remix, Fusion, Orchestra, Coir and Acoustic; Comparative studies of Hindustani and Karnatak Swaras and Taalas; Karnatak names of Popular Hindustani Ragas; Knowledge of different Layakaaries such as dugun, Tigun, Chaugun, Aad, Kuad and Viaad.

Unit-VI

History of Indian Music, contribution of Musicologists and their textual tradition:

Study of the Historical Development of Hindustani Music from Vedic to Modern period;

Ancient Medieval and Modern Musicologist and Scholars:- Bharat, Naarad, Matang, Someshwardev, Jagdekmall, Nanyadev, Sharangdev, Parshwadev, Sudhakalash, Maharana Kumbha, Ramamatya, Damodar Pandit, Pt. Ahobal, Shriniwas, Hridyanarayana, Vyankatmakhi, Pt. Vishnu Digambar Palushkar, Pt. Vishnu Narayan Bhatkhande, Pt. Vinayak Rao Patwardhan, Pt. Omkarnanath Thakur, Acharya Birhaspati, Thakur Jaidev Singh, Sharachchandra Shridhar Paranjape, Bhagwat Sharan Sharma, Dr. Prem Lata Sharma, Dr. Subhadra Choudhary, Prof. R.C. Mehta, Prof. Pradeep Kumar Dixit.

Study of ancient, Medieval and Modern Treatises in Indian Music like Natya Shastra, Nardiya Shiksha, Sangeet makarand, Brihaddeshi, Manasollaas, Sangeet Chudamani, Bharat Bhashya, Sangeet Ratnakar, Sangeet Samaysar, Sangeetopanishatsaaroddhar, Sanageet Raj, Swaramalekalanidhi, Sangeet Darpan, Sangeet Paarijaat, Raga Tatvavibodh, Hridaya Kautuk, Hridaya Prakash, Chaturdandi Prakashika, Sangeet Chintamani, Pranavbharati etc.

Unit-VII

Compositional forms and their evolution:

Prabandh, Dhrupad, Dhamaar, Saadra Kheyaal, Tarana, Trivat, Chaturang, Sargam Geet, Lakshan Geet, Raagmaala etc. Thumri, Dadra, Tappa, Hori, Kajri, and Chaiti etc. Light Music: Geet, Gazal and Bhajan etc. Firozkhani Gat, Maseetkhani Gat, Razakhani Gat and Zafarkhani Gat and its kind. Jaati, Javali, Kriti, Tillana, Raagam, Taanam, Pallavi.

Origin, development and presentation of above said vocal and instrumental compositions Popular artists in the field of above said forms.

Unit-VIII

Taal Paddhati and Musical Instruments and its Classification:

Classification of Indian Musical Instruments in Ancient, Medieval and Modern period Different types of Veenas in ancient period Tat - Sitar, Sarod, Violin, Dilruba, Israj, Santoor, Tanpura, Surbahhar, Guitar. Ghan - Jaltarang, Ghatam, Morsing, Chipali, Manjeera, Jhanjh, Kartal Sushir - Flute and its varieties,

Shehnai, Nagaswaram, Harmonium Avanaddha - Pakhawaj, Tabla, Mridangam, Kanjira, Khol, Chang, Nakkara, Duff, Hudaka, Dholak. Origin, evolution, playing techniques and famous artist of these Instruments.
Detailed knowledge of Uttar Bhartiya Taal Padhati and Taalas used in Uttar Bhartiya Sangeet.
A brief knowledge of Taalas used with Rabindra Sangeet. Laya and Layakari.
Detailed knowledge of Hindustani and Karnatak taal notation system. Brief knowledge of staff notation system.

Unit-IX

Contribution of composers / performers to Indian Music:
Tansen, Haridas, Gopal Nayak, Sadarang, Pandit Balkrishna Bua Ichalkaranjikar, Pandit Vishnu Digambar Palushkar, Pandit Vishnu Narayan Bhatkhand, Ustaad Faiyaz Khan, Ustad Bade Gulam Ali Khan, Ustad Nisaar Hussain Khan, Pandit Omkar Nath Thakur, Pandit Vinayak Rao Patwardhan, Pandit Naryan Rao Vyas, Pandit C.R. Vyas, Pandit Krishna Rao Shankar Pandit, Pandit Mallikarjun Mansoor, Smt Gangubai Hangal, Kesar Bai Kerkar, Abdul Kareem Khan, Heerabai Barodekar, Suhasini Koretkar, Bade Ramdas, Siddheswari Devi, Begham Akhtar, Shobha Gurtu, Girija Devi, Savita Devi, Moghubai Kurdikar, Kishori Amonkar, Pandit Kumar Gandharv, Pandit Jasraj, Pandit Balvant Rai Bhatt. Pt. Ramashraa Jha. Asad Ali Khan, Pt. Lal Mani Mishra, Abdul Halim Zafar Khan, Ali Akbar Khan, Sharan Rani, Amjad Ali Khan, Anath Lal, Panna Lal Ghosh, Vijay Raghav Rao, Ragunath Seth, Hari Prasad Chaurasia, Ahmad Jaan Thirakava, Pt. Samta Prasad, Kishan Maharaj, Kudau Singh, Paagal Das, Brij Bhooshan Kabra, Vishwa Mohan Bhatt, Shiv Kumar Sharma, Bhajan Sopori, M.S. Gopal Krishnan, V.G. Jog, N. Rajam, Appa Jalgaonkar, Mehmood Dhaulpuri. Recipient of Bharat Ratna:- M.S. Subbhalakshmi, Pt. Ravi Shankar, Utsad Bismillah Khan, Lata Mangeshkar and Pt. Bhim Sen Joshi.
Natthu Khan, Modu Khan, Bakshu Khan, Abid Hussian Khan, Haji Vilayat Ali, Salari Khan, Chudiya Imam Baksh, Ram Sahay, Munir Khan, Habibuddin Khan, Ahmemadjan Thirukuwa, Amir Hussain, Jahangir Khan, Shekh Daud, Bade Munne Khan, Karamtullah Khan, Allarakha Khan, Gyan Prakash Ghosh, Nikhil Ghosh, Gama Maharaj, Kishan Maharaj, Kanthe Maharaj, Samta Prasad (Gudai Maharaj), Anokhe Lal Mishra, Bhai Gaitonde, Pandharinath Nageshkar, Suresh Talwalkar, Hashamat Ali Khan, Zakir Hussain

Unit-X

Gharna and Institutional System and conferences of Hindustani Music: General study of origin and development of Gharana. Institutionalised system and their contribution to Hindustani Music.

Four baanies of Dhrupad and its importance to Hindustani Music. General study of various Gharanas of Dhrupad Kheyal and Instrumental Music.

Special features of Gharanas in vocal and Instrumental Music and its famous artists. Purab and Punjab Angas of Tumari.

Historical Evaluation & Developments of Gharanas of Tabla & Pakhawaj, Delhi Gharana, Ajarada Gharana, Farrukhabad Gharana, Lucknow Gharana, Benaras Gharana, Punjab Gharana, Nana Panase Gharana, Kudau Singh Gharana. Varna Nikas (Playing Technique) in different Gharanas. Main Characteristics of Peshkar, Quida, Rela, Gat, Tukada, Paran, Tihai, Chakradar & Laggi Ladi on the basis of Gharanas. Importance and utility of Tabla & Pakhawaj in classical music, semi classical, sugam & film music. Universities, Academies and other institutions, Renowned Professors, Gurus, Academicians, Administrators who are propagating music.

Important music conferences in India. National and International awards in the field of music. Contribution of Music educational institutes Akademies, Prasar Bharati, Song and Drama Division and Film in Indian Music.

All National and International Awardees in the field of Music, Dance, folk music and folk dances with special reference to percussion instrumentalists.

SYLLABUS

Unit - I

Vedic-Literature

(a) General Introduction of Vedic Literature:

1. Main theories regarding the Vedās : Maxmüller; Indian traditional views.
2. Saṁhitā Literature General Introductions only
3. Dialogue Hymns: Pururavā-Urvaśī; Yama-yamī; Saramā-Paṇi ; Viśvāmitra-Nadī
4. Brāhamaṇa-Literature General Introduction only.
5. Āraṇyaka Literature General Introduction only
6. Vedāṅgas: Śikṣā; Kalpa; Vyākaraṇa; Nirukta; Chandas; Jyotiṣa General Introduction only

Unit - II

(b) Specific Study of Vedic Literature:

1. Study of the following hymns:

   a) Ṛgveda : Agni (1.1); Varuṇa (1.25); Sūrya (1.125); Indra (2.12);

   Uṣas (3.61); Parjanya (5.83);

   Puruṣa (10.90); Hiraṇyagarbha (10.121);

   b) Śuklayajurveda : Śivasaṁkalpa , Chapter-34 (1-6)
   c) Prajāpati-Chapter-23 (1-5)
   d) Atharvaveda : Rāṣṭrābhivardhanam (1.29); Kāla (10.53); Prithivī (12.1)

2. Brāhmaṇa Literature

   Subject-matter; Vidhi and its types; Agnihotra; Agniṣṭoma; Darśapūrṇamāsa; Yajña; Pañcamahāyajña;

3. Upaniṣad Literature:

   Subject-matter and main concepts with special reference to the following Upaniṣads;

Īśa; Kaṭha; Kena; Bṛhadārṇyaka ; Taittirīya;

4. Ṛkprātiśākhya : Definitions of Samānākṣara ; Sandhyakṣara; Aghoṣa; Soṣman; Svarabhakti ; Yama ; Rakta; Saṁyoga; Pragṛhya ; Riphita
5. Nirukta (Chapters-I & 2)

6. Four-fold division of Padas-Concept of Nāma; Concept of Ākhyāta ; Meaning of Upasargas; Categories of Nipātas.
7. Purposes of the study of Nirukta
8. Principles of Etymology
9. Etymology of the following words:

Āchārya; Vīra; Hrada; Go; Samudra; Vṛtra; Āditya; Uṣas; Megha; Vāk; (Chapter-7; Daivatakāṇḍa) Vedic Accent- Udātta, Anudātta and Svarita

Unit - III

(c) Darśana:

1. General Introduction of major schools of Darśana with special reference to the following:

(Cārvāka , Jaina, Bauddha) Nyāya, Sāṁkhya, Yoga, Kashmir Shaiv Darshan Tattva mimansa, Vaiśeṣika, mīmānsā

Unit - IV

(d) Darśana Literature: Special Study:

1. Īśvarakṛṣna : Sāṁkhyakārikā - Satkāryavāda, Puruṣasvarūpa, Prakṛtisvarūpa, Sṛṣṭikrama, Pratyaysarga, Kaivalya.
2. Sadānanda : Vedāntasāra - Anubandha-catuṣṭaya, Ajñāna, Adhyāropa-Apavāda, Lingaśarīrotpatti, Pañcīkaraṇa, Vivarta, Jīvanmukti
3. Annambhaṭṭa, Tarkasaṁgraha / Keśavamiśra; Tarkabhāṣā : Padārtha ; Kāraṇa; Pramāṇa; (Pratyakṣa; Anumāna; Upamāna; Śabda), Prāmāṇyavāda, Prameya .
4. Laugākṣibhāskara ; Arthasaṁgraha.
5. Patañjali ; Yogasūtra - (Vyāsabhāṣya) : Cittabhūmi, Cittavṛttis ; Concept of Īśvara; Yogāṅgas; Samādhi ; Kaivalya

Unit - V

(e) Grammar and Linguistics:

1. General Introduction of the following grammarians:

Pāṇini , Kātyāyana , Patañjali , Bhartṛhari , Vāmanajayāditya , Bhaṭṭojidīkṣita , Nāgeśabhaṭṭa , Kaiyyaṭa , Pāṇinīya Śikṣā.
Linguistics:
Definition of Language, Geneological and Morphological classification of Languages, Speech Mechanism and classification of sounds: Stops, Fricatives, Semi-Vowels and vowels (with special reference to Sanskrit sounds).
Phonetic Laws (Grimm, Grassman, Verner). Directions of semantic change and reasons of change. Definition of Vākya and its types

General introduction of Indo-European family of Languages Difference between Vedic Sanskrit and Classical Sanskrit Difference between Bhāṣā and Vāk Difference between language and dialect.

Unit - VI

(f) Specific Study of Grammar

Definition : Saṁhitā, Saṁyoga Guṇa, Vṛddhi, Prātipadika, Nadī , Ghi, Upadhā, Apṛkta, Gati, Pada, Vibhāṣā , Savarṇa, Ṭi, Pragṛhya, Sarvanāmasthāna, Bha , Sarvanāma, Niṣṭhā .
Sandhi - Ac sandhi, Hal sandhi, Visarga sandhi (according to laghusiddhāntakaumudī)
Subanta – Ajanta - Rāma , Sarva (in all genders) , Viśvapā, Hari , Tri (in all genders) , Sakhi , Sudhī , Guru , Pitṛ , Gau , Ramā , Mati , Nadī , Dhenu , Mātṛ , Jñāna , Vāri , Madhu .
Halanta - Lih , Viśvavāh , Catur (in all genders) , Idam, Kim, Tad (in all genders), Rājan , Maghavan , Pathin , Vidvas , Asmad , Yuṣmad .
Samāsa - Avyayībhāva , Tatpuruṣa , Bahuvrīhi , Dvandva (according to laghusiddhāntakaumudī)
Taddhita - Apatyārthaka and Matvarthīya (According to Siddāntakaumudī),
Tiṅanta - Bhū , Edh , Ad , Us, Hu , Div , Ṣuñ , Tud , Tan, Kṛ , Rudh , Krīñ, Cur .
Prayayānta - Nijant, Sannanta , Yaṅanta , Yaṅluganta , Nāmdhātu.
Kṛdanta - Tavya / Tavyat , Anīyar , Yat , Ṇyat , Kyap , Śatṛ , Śānac , Ktvā , Kta , Ktavatu , Tumun , Ṇamul .
Strīpratyaya - According to Laghusiddhāntakaumudī.

Kāraka Prakarana - According to Siddāntakaumudī .
Parasmaipada and Ātmanepada Vidhāna - According to Siddāntakaumudī .
Mahābhāṣya (Paspaśāhnika)- Definition of Śabda, Relation between Śabda and Artha, Purposes of the study of grammar, Definition of Vyākaraṇa, Result of the proper use of word , Method of grammar .
Vākyapadīyam (Brahmakāṇḍa) - Nature of Sphoṭa, Nature of Śabda-Brahma,
Powers of Śabda-Brahma, Relation between Sphoṭa and Dhvani , Relation between Śabda and Artha, Types of Dhvani, Levels of Language.

Unit - VII

Sanskrit Literature, Poetics and Prosody

(a) General Introduction of following

Bhāsa, Aśvaghośa , kālidāsa, Śūdraka, Viśākhadatta, Bhāravi, Māgha, Harṣa, Bāṇabhaṭṭa, Daṇḍin, Bhavabhūti, Bhaṭṭanārāyaṇa, Bhilhaṇa, Shrīharṣa, Ambikādatta vyāsa, Panditā Kṣamārao, V. Raghavan, Shri Dhar Bhaskar Varnekar
Schools of Sanskrit Poetics – Rasa, Alaṅkāra, Rīti, Dhwani, Vakrokti, Aucitya,
Western Poetics – Aristotle, Longinus, Croche

Unit - VIII

(b) Specific study of the following

Poetry: Buddhacaritam (First Canto), Raghuvaṁśam (First Canto), Kirātārjunīyam (First Canto), Śiśupālavadham (First Canto), Naiṣadhīyacaritam (First Canto)
Drama: Svapnavāsavadattām, Abhijñānaśākuntalam, Mṛcchakaṭikam, Uttararāmacaritam, Mudrārākṣasam, Uttararāmacaritam, Ratnāvalī
Prose:Daśakumāracaritam (viii Ucchvāsa), Harṣacaritam (V Ucchvāsa), Kādambarī (Śukanāsopadeśa) Campū Kāvya - Nala Campū (I Ucchvāsa) Sāhityadarpaṇaḥ:
Definition of Kāvya, Refutation of other definitions of Kāvya, Śabdaśakti - Saṅketagraha; Abhidhā; Lakṣanā; Vyanjanā, Kāvyabheda (Chapter Fourth), Śravyakāvya (prose poetry and mix)
Kāvyaprakaśa –Kāvyalakṣhṇa, Kāvyaprayojana, Kāvyahetu, Kāvyabheda, Śabdaśakti, Abhihitānvayavāda,

Kāvyaprakaśa –Kāvyalakṣhṇa, Kāvyaprayojana, Kāvyahetu, Kāvyabheda, Śabdaśakti, Abhihitānvayavāda, Anvitābhidhānvayavāda, concept of Rasa, discussion of Rasasūtra, Rasadoṣa, Kāvyaguṇa, Vyanjanāvriti (Fifth Chapter)

Alaṁkāras –Vakrokti; Anuprāsa, Yamaka, Śleṣa, Upamā, Rūpaka, Utprekṣā, Samāsokti, Apahnuti, Nidarśanā, Arthāntaranyāsa, Dṛṣṭānta, Vibhāvanā, Viśeṣokti, Svabhāvokti, Virodhābhāsa, Saṅkara, Sansṛṣṭi

Dhvanyāloka (I Udyota)

Vakroktijīvitam (I Unmeṣa)

Bharata – Nāṭyaśāstram (First and Sixth Chapter)

Daśarūpakam (First and Third Prakāśa)

Chanda – Āryā, Anuṣṭup, Indravajrā, Upendravajrā, Vasantatilakā, Upajāti, Vaṁśastha, Drutavilambita, Śālinī, Mālinī, Śikharṇī, Mandākrāntā, Hariṇī, Śārdūlavikrīḍita, Sragdharā

Unit - IX

Purāṇetihāsa, Dharmaśāstra and Epigraphy

(a) General introduction of the followings:

Rāmāyaṇa –Subject matter, age, society in the Rāmāyaṇa, Rāmāyaṇa as a source of later Sanskrit works and literal value of the Rāmāyaṇa, legends in the Rāmāyaṇa

Mahābhārata –Subject matter, age, society in the Mahābhārata, Mahābhārataas a source of later Sanskrit works and literal value of the Mahābhārata, legends in the Mahābhārata

Purāṇa –Definition of Purāṇa, maha Purāṇa and Upa Purāṇas, Purāṇiccosmology and Purāṇic legends

General introduction of main Smṛitis.

General introduction Kauṭilīya Arthaśāstra

Paleography –History of the decipherment of Brāhmī script, Theories of the origin of Brāhmī Script

Inscriptions - General introduction

Origin and development of Brahmi script

Thesis of the origin of Brahmi Script.

History of the decipherment of Brahmi Script Inscriptions.

Subject matter of the Brahmi Script Inscriptions of Maharaja Ashoka.

Unit - X

(b) Specific study of the following

Kauṭilīya arthaśātra (First – Vinayadikarika)

Manusmṛti (I, II and VII Adhyāyas)

Yājñavalkyasmṛti (Vyavahārādhyaya only)

Paleography and Inscriptions –

Brahmi Script of Mauryan and Gupta periods

Inscription of Ashoka – Major Rock Edicts, Major Pillar Edicts

Post – Mauryan inscriptions – Sāranātha Buddhist Image Inscription of Kaniṣka's regal – year, 3, Girnār Rock Inscription of Rudradāman, Hāthīgumphā inscription of Khāravela

Gupta and Post-Gupta inscriptions – Allahabad Pillar Inscriptions of Samudragupta, Mandasor Pillar Inscription of Yasodharman, Banāskherā Copper Plate Inscription of Harṣa, Aihole Stone Inscription of Pulakeśīn II

Public service Commission

Syllabus for screening test for Assistant Professor in Biochemistry

UNIT I - Biomolecules

Carbohydrates

- Definition, classification, characterization and biological importance of mono- and disaccharides
- Structure and conformation of sugars
- Structure and function of homo- and heteropolysaccharides
- Mucopolysaccharides and proteoglycans
- Classification of lipids
- Chemical composition and properties of triglycerides
- Nomenclature and properties of saturated and unsaturated fatty acids
- Properties and functions of phosphoglycerides and sphingolipids
- Structure and functions of steroids (cholesterol and bile acids)
- Amino acids
- Structure, classification and physiochemical properties
- Essential and non-essential amino acids
- Characteristics of a peptide bond
- Oligo-peptides and polypeptides
- Chemical synthesis of a peptide

Proteins

- Levels of protein structure
- Elucidation of primary structure
- Forces stabilizing the tertiary structure
- Protein denaturation and renaturation

Nucleic Acids

- Primary, secondary and tertiary structure of DNA
- Properties of DNA
- Primary, secondary and tertiary structure of RNA
- Functions of various types of RNA

Unit II - Cell Biology

Cell membrane

- Chemical composition
- Structure and function of membrane proteins
- Membrane lipids and membrane fluidity
- Membrane potential
- Structure and function of Cell wall, Mitochondria, Golgi complex Endoplasmic reticulum, Nucleus and nucleolus, Lysosomes, plant vacuoles and Peroxisomes

The cytoskeleton

- Microtubules
- Intermediate filaments
- Microfilaments

Chromosome and chromatin structure

Cell cycle and its stages, Regulation of cell cycle

Mitosis- Prophase, prometaphase, metaphase, anaphase, telophase, cytokinesis

Motor proteins and their role in cell division

Meiosis - The stages of meiosis, Genetic recombination

Apoptosis, program cell death, Necrosis, Autophagy.
Cell transformation and cancer, oncogenes and tumour suppressor genes,
Extracellular matrix and Cell-cell interaction
Cell adhesions molecules
Cell junctions: tight junction, desmosome, hemidesmosome and gap junctions

Unit III -Protein Biochemistry

Amino acids
Amino acid metabolism
- Metabolic fate of amino groups
- Pathways of amino acid catabolism
- Nitrogen excretion and urea cycle
- Biosynthesis of amino acids
- Derivatives of amino acids
- Regulation of amino acid metabolism

Protein
- Primary structure of the protein and its determination
- Secondary structure, types
- Tertiary structure, forces stabilizing tertiary structures
- Quaternary structures

Quantitative estimation of proteins by
- Lowry's method
- Bradford's method
- Spectrophotometric method

Polyacrylamide gel electrophoresis of purified proteins and PAGE/SDS-PAGE
Molecular weight determination by gel filtration chromatography and SDS-PAGE

Unit IV -Metabolism and Bioenergetics

- Energy transformation by biological systems
- Concept and significance of free energy
- Phosphoryl transfer potential
- Coupled reactions
- ATP as energy currency
- ATP Cycle

Carbohydrate metabolism and its regulation
- Glycolysis and regulation
- Citric acid cycle, its function in energy generation and biosynthesis of energy rich-bonds, regulation
- Pentose phosphate pathway and its regulation
- Lipid metabolism and its regulation
- Fatty acid oxidation- α, β, ω, oxidation and lipo-oxidation.
- Fatty acid biosynthesis- Acetyl CoA carboxylase, Desaturase and elongase
- Biosynthesis of triacylglycerols, Phosphoglycerates and sphingolipids
- Biosynthetic pathways for terpenes, steroids and prostaglandin
- Metabolite transport across mitochondrial membrane
- Structural organization of respiratory chain
- Electron flow in respiratory chain
- Inhibitors of ETC

- Oxidative phosphorylation
- Coupling of oxidation and phosphorylation
- Structure and function of ATP-synthase complex
- Short-circuiting of proton gradient
- Regulation of rate of oxidative phosphorylation

Nucleic Acid metabolism

- Degradation of purines and pyrimidines
- Biosynthesis and regulation of purine and pyrimidine nucleotides
  - Denovo and salvage pathways
  - Biosynthesis of ribonucleotides, deoxyribonucleotides and polynucleotides
  - Structure and regulation of ribonucleotide reductase
  - Inhibitors of nucleic acid biosynthesis
- Inborn errors of amino acid metabolism- Alkaptonuria, Phenylketonuria, Albinism, Homocysteruria, Tyroninemia and other aminoaciduria.
- Disorders of lipids: lipid mal-absorption and steatorrhea, sphingolipidosis, Clinical interrelationships of lipids, lipoproteins and apolipoproteins
- Disorders of nucleic acid metabolism (Purine and Pyrimidine metabolism).

Unit V. Molecular Biology

Replication

- Unit of replication
- Replication Origin and Replication Fork
- Enzymes involved in replication
- Initiation, Elongation and Termination of Replication
- Fidelity of Replication

Recombination – homologous and side specific recombination

DNA damage and repair mechanism

Transcription

- Transcription in prokaryotes and eukaryotes
- Transcriptional factors and their role
- RNA polymerases
- Formation of initiation complex
- Elongation and termination
- Inhibitors of transcription

RNA processing, splicing, polyadenylation, capping

Regulation of gene expression in

- Prokaryotes
- Eukaryotes
- Viruses

Transcriptional activators and repressors

Role of chromatin in regulating gene expression and gene silencing

Epigenetics and its importance in regulation of gene expression

Translation

- Genetic code
  - General characteristics of genetic code
  - Deciphering of genetic code
- Ribosomes as the site of protein synthesis, polysomes
- Activation of amino acids

Chain initiation, elongation and termination in prokaryotes and eukaryotes
Control of translation (Role of Guanine nucleotides)
Translational fidelity, Kinetic proof reading
Positive and negative regulation of translation
Inhibitors of protein synthesis

Unit VI Enzymology

Enzyme classification and nomenclature
Methods of examining enzyme – substrate complexes
Enzyme kinetics
Factors influencing enzyme reaction velocity
Henri and Michaelis Menten equation, Briggs-Haldane modification
Determination and significance of kinetic constants
Bisubstrate Reactions
Ping Pong and ordered Bi Bi reaction mechanism
Enzyme inhibition
Reversible inhibition, its types
Determination of inhibitor constants
Irreversible inhibition
Enzyme assays
Mechanism of catalysis of
Serine proteases
Triose phosphate isomerases
Enzyme regulation
General mechanism of enzyme regulation
Allosteric enzymes
Sigmoidal kinetics and their physiological significance
Symmetric and sequential modes for action of allosteric enzymes and their significance
Feedback inhibition and feed forward stimulation
Reversible and irreversible covalent modifications of enzymes

Unit VII- Immunology and animal cell culture

Historical perspective
Antigenicity, Features of antigeneticiy, super antigens, adjuvants
Cells of immune system: Myeloid, Mononuclear cells, T-Lymphocytes, B-Lymphocytes, NK-Cells
Primary and secondary lymphoid organs: Thymus, Bursa of fabricus, Peyers Patch, Spleen, Lymph nodes
Mucosal associated and cutaneous associated lymphoid tissues
Immunoglobulin, structure, classes and subclasses
Multigene organization of Ig gene, variable region gene rearrangements, allelic exclusion, generation of diversity of Ig, Assembly and secretion of Ig, class switch, regulation of Ig transcription
Humoral and cell mediated immunity: B cell development and activation, BCR, T cell development and activation, TCR
Regulation of system: complement cascade, Biological function and its regulation
Complement fixation test
Cytokines and their role in immune regulation
Major Histocompatibility Complex: different classes, organization and biological function
Transcription regulation of MHC

Hypersensitivity: Type I, II, III, and IV
Autoimmunity and autoimmune diseases
Single organ and systemic autoimmune diseases
Brief introduction to Primary and secondary immunodeficiencies
Mechanisms of transplantation, Examples of organ transplantation
Examples of immune response to Viruses, bacteria, protozoa, fungal and helminthic infection
Immunoblotting and diagnosis of various important diseases, only infectious and few cancerous types
Immuno-biotechnology
Development of Monoclonal Antibodies by Hybridoma Technology
Vaccination: Conventional and genetically engineered vaccines
Antigen – antibody interaction and its applications
Techniques – ELISA, RIA, fluorescent IA, agglutination of pathogenic bacteria, Haemagglutination and its inhibition
Enumeration of total T-cell numbers by sRBC, resetting technique
Determination of total number of B-lymphocytes by staining for surface IgG

Animal Cell Culture
Primary and established cell lines
Types of various cell lines
Biology and characterization of the cultured cells
Introduction to balanced salt solutions and simple growth medium
Role of CO_2, serum and supplements, Serum and serum free media, defined media and their applications, antibiotics
Immortalization and methods used to immortalize cells
Viability and cytotoxicity assays: Trypan blue, MTT, TUNEL and ELISA based assays
Concept of Plant Cell culture

Unit VIII – Genetic and Genetic Engineering
Introduction to Mendelian Genetics
Mendel's Laws of inheritance
Dominance, Segregation, Independent assortment , Gene interactions
Incomplete dominance
Co-dominance , Epistasis, Pleiotrophy
Concept of alleles
Multiple alleles, Lethal alleles, Pseudoalleles
Linkage -Sex linkage
Sex limited and sex influenced characters, chromosome mapping, tetrad analysis
Human Genetics
Normal Human Karyotype
Autosomal inheritance-dominant and recessive
X-linked linked inheritance
Y-linked linked inheritance
Genetic Diseases
Pedigree analysis for the inheritance pattern of genetic diseases
Genetic Counselling
Chromosomal Changes
Number variation – Euploidy (auto and allopolyploidy), aneuploidy
Structural variations – duplications, Inversions, translocations
Population genetics - gene pool, gene frequency

- Hardy-Weinberg law
- Non-random mating-factors influencing, heritability
- Genetic polymorphism-transient and stable

Recombinant DNA Technology

- Vectors: Plasmids, bacteriophages, phagemids, cosmids, YACs, and BACs
- Methods of creating recombinant DNA molecule
- Transformation and screening of recombinant vector
- Confirmation of insert
- Expression strategies in different hosts, vector and host engineering
- Types of restriction endonucleases
- Library construction
- Types of libraries
- cDNA and genomic libraries

Unit IX - Physiology and Microbiology

Plant growth regulators

- Auxins
  - Chemical nature, biosynthesis and metabolism
  - Physiological and developments effects
  - Molecular basis of its action
- Gibberellins
  - Chemical structure, biosynthesis, metabolism and mechanism of its molecular effects
- Cytokinin
  - Properties and biological role
  - Cellular and molecular modes of cytokinin action
- Abscisic acid
  - Chemical structure, metabolism and transport
  - Molecular effects in the regulation of growth and development

Photosynthesis

- Photosynthesis in higher plants – general concepts
- Organization of the photosynthetic apparatus
- Mechanism of electron transport in photosynthesis
- Proton transport and ATP synthesis
- Calvin cycle and its regulation
- C4 and CAM pathways
- Repair and regulation of photosynthetic machinery
- Photorespiration and its significance

Introduction to Endocrinology

- Mechanism of action of hormones - hormone receptors
- Second messenger mechanisms for mediating intracellular hormone functions
- Components and general mechanism of Signal Transduction
- Signaling molecules, cell surface receptor Signaling motifs: SH2, SH3, PH and PDZ domains,
- G- protein linked cell-surface receptors
- Role of protein kinases in cell signaling: Serine/Threonine and Tyrosine kinases,

Different Pathways of intra cellular signal transduction

Structure, biosynthesis, secretion, transport, mechanism of action and physiological role of

- Pancreatic and Thyroid hormones

Hypothalamic-Pituitary axis

Pituitary hormones and their control by hypothalamus

Structure, biosynthesis, secretion, transport, mechanism of action and physiological role of

- Adrenal, Gastrointestinal, Sex hormones

A brief introduction to major groups of microorganisms

- Bacteria, Viruses, Fungi, Protozoa, Mycoplasma and Algae

Ultrastructure of bacterial cell wall

Structure and functions of peptidoglycan in gram positive and gram negative organisms,
Functions of polymeric components in outer membrane and acidic polymers in gram negative organisms
Cell surface appendages
Pilli, Capsule, Flagella (Locomotion by flagella, chemotactic movement)
Microbial growth
Different phases of microbial growth
Measurement of microbial growth
Growth kinetics
Factors affecting microbial growth
Quorum sensing,
Control of microbial growth-Physical and chemical methods
Microbial classification and nutritional requirements
Mechanism of bacterial PTS
Transport and Iron Uptake
Microbial genetics
Modes of genetic exchange in microbes- Conjugation, Transformation and Transduction
Antimicrobial agents-their classification
Mechanisms of action of antimicrobial agents
Classification of antibiotics
Selective toxicity and therapeutic index
Mechanisms of antibiotic resistance
Superbugs, Multidrug resistance
Plasmids and genetic mutation in resistance
Normal microbial flora
Pathogenicity, virulence factors, bacterial toxigenecity

Unit X - Biochemical Techniques

Centrifugation
Factors affecting sedimentation
Types of centrifugation including differential, density gradient and ultracentrifugation
Analytical and preparative centrifugation
Applications of centrifugation
Chromatography
Basic principle and applications of chromatographic techniques
Gel filtration, Affinity, Gas, Ion Exchange and High-pressure liquid chromatography
Electrophoresis
Types of electrophoresis
Factors affecting electrophoretic mobility
Uses of electrophoresis
Isoelectric focusing
Different blotting techniques
Northern, Southern
Polymerase chain reaction, Multiplex, Gradient and Nested PCR, RT-PCR
Principles of - RFLP, RAPD and AFLP techniques
Single strand conformation polymorphism and heteroduplex analysis, Mutagenesis
Preparation and analysis of RNA and DNA probes and tags
Detection of molecules in living cells, in situ localization by techniques such as FISH and GISH
Methods for analysis of gene expression at RNA level and protein level - qPCR
Large-scale expression analysis using micro array analysis
Flow-cytometry
Microscopy
Light, electron (scanning and transmission), phase contrast and fluorescence microscopy

- Freeze- fracture techniques
- Confocal Microscopy

Protein detection and protein-protein interaction techniques

- Western blotting and its applications, Far-western blotting, dot blotting
- Immunoprecipitation, Co-Immunoprecipitation
- Yeast Two Hybrid screening, FRET, FREP
- Analysis of interacting proteins with SPR spectroscopy,
- Eastern Blotting
- Mass spectrometry

Protein-DNA interaction techniques

- Gel Retardation Assay
- Foot printing analysis
- ChIP, ChIP-Seq
- DNA pull down assays
- Reporter assay (Leuciferase reporter assay)
- Microplate capture and detection assay

Gene silencing

- RNA interference
- siRNA, micro RNA and shRNA mediated gene silencing
- Ribozyme mediated gene silencing

Genome Editing

- Cre-Lox recombination system
- Zinc Finger Nucleases (ZFNs)
- TALEN system
- CRISPR-Cas9 technology

DNA Sequencing

- Next generation sequencing
  - Sequencing while synthesizing
  - Ion Torrent/semiconductor sequencing
  - Pyrosequencing
- Genome wide sequencing (GWS) and Whole genome gene sequencing (WGS)
- Genome-wide association studies (GWAS)
- Transcriptome and Exome sequencing

Public Service Commission

Syllabus for screening test for Assistant professor in sericulture

UNIT-01: GENERAL SERICULTURE: SILK MAKETING, ORGANIZATIONAL SETUP & EXTENSION

UNIT 01-A: General Sericulture

- Characteristics features of sericulture: history, silk route and current status of sericulture in India.
- Classification of textile fibers: natural & synthetic fibers. Properties of mulberry silk in comparison to other fibers and tassar, eri and muga silk.
- Organizational setup of sericulture: policies of CSB, NGO's, Women empowerment. Marketing of silk: silk testing & grading. Leaf cocoon ratio, cocoon dfls ratio & WTO in sericulture.

UNIT 01-B: Sericulture Extension

- Extension programmes in sericulture: Extension services in chawki Rearing Centers, Basic Seed Farms, Grainages and Markets. Six P's of planning. Budgeting.
- SWOT analysis. Program Evaluation and Review Technique (PERT). Tele-Agri-Advisory Services for Farmers: Kisan Call Centre, Common Service Center.
- Models of Agricultural Development, WTO's Agreement. Sustainable cropping and farming systems

UNIT-02: MULBERRY BIOLOGY AND PRODUCTION

UNIT 02-A: MULBERRY BIOLOGY

- Taxonomy of mulberry: morphology & anatomy of leaf stem & root. Popular cultivars, medicinal value. Reproductive biology of mulberry. Chawki gardens. Phyllotaxy.
- Soil for mulberry: physical and chemical properties, pH, NPK dosage & schedule for irrigated and rainfed conditions.
- Manures, vermicompost, biofertilizers, & IPNM in mulberry cultivation. Biostimulants.

UNIT 02-B: MULBERRY PRODUCTION

- Essential nutrients for mulberry. Sexual & asexual propagation in mulberry: grafting, layering, budding and seedling.
- Pruning, training, irrigation, drainage methods and schedule in mulberry cultivation.

- Mulching: methods; merits and demerits, weed management. Common weeds flora of mulberry.
- Methods of determining leaf quality. Moisture percentage & moisture retention capacity.

UNIT- 03: SILKWORM BIOLOGY, PHYSIOLOGY AND PRODUCTION

UNIT 03-A: SILKWORM BIOLOGY

- Classification of insects: life cycle of silkworm, embryonic development & parthenogenesis.
- Silkworm physiology: digestion, excretion, circulation & respiration in silkworm
- Silk gland: silk synthesis, composition of silk protein
- Silkworm transgenesis: manipulation of sericin and fibroin proteins and metamorphosis.

UNIT 03-B: SILKWORM PHYSIOLOGY & PRODUCTION

- Silkworm biochemistry: Amino acids, protein, carbohydrates, enzymes, bioenergetics and biological oxidation.
- Artificial diet: composition and schedule of feeding.
- Insect integument: segmentation & body regions. Mouth parts in different ages.

UNIT- 04: SILKWORM Rearing Technology

UNIT 04-A: SILKWORM REARING PRACTICES

- Silkworm rearing: ideal conditions. Rearing house, rearing equipments, disinfection its methods.
- Grainages: Incubation and black boxing. Feeding frequency. Chawki rearing: late age rearing, bed cleaning and disinfectants
- Moulting: care during moult, symptoms and precautions Mouting and spacing.
- Mechanization in sericulture: field machines

UNIT 04-B: GRAINAGE TECHNOLOGY

- Silkworm seed organization: P1, P2, P3 & P4 stations. Silkworm egg production centres; Govt. & LSPs.
- Mother moth examination. Acid treatment and Hibernation of silkworm eggs.
- Gut examination: forced eclosion test, advance pebrine detection tests.

UNIT- 05: CELL AND MOLECULAR BIOLOGY & IMMUNOLOGY

UNIT 05-A: CELL BIOLOGY

- Cell: prokaryotic & eukaryotic cells; cell organelles, cell cycle and regulation of cell cycle in *Bombyx mori* L.
- Nucleic acids: DNA & RNA, transcription, translation gene regulation in eukaryotes and prokaryotes.
- Model organisms: Silkworm, *E. coli* and fruit fly as model organism.

UNIT 05-B: SILKWORM IMMUNOLOGY

- Immunology: immunity and its types, antigen-antibodies reaction, silkworm immune system, lipopolysacchrides (LPS) and ceropins B in silkworm immunity.
- Autoimmune diseases: major histocompatibility complex (MHC). Transplantation, graft retention and rejection.
- Antibody generation: ELISA, RIA, Blotting techniques. Hybridization and GISH.

UNIT- 06: MULBERRY PHYSIOLOGY, BREEDING AND GENETICS

UNIT 06-A: MULBERRY PHYSIOLOGY

- History of Plant Breeding: Pre and post Mendelian era, Genetic basis of breeding self- and cross-pollinated crops. Plant introduction. Objectives of mulberry breeding.
- Heritability and genetic advance: Genotype-environment interaction; General and specific combining ability.
- Stress physiology; Physiology of flowering: Photoperiodism and Vernalization. Phytochrome – concept. Senescence, dormancy and seed germination. Biological Nitrogen fixation. Growth regulators

UNIT 06-B: MULBERRY BREEDING AND GENETICS

- Cytogenetics: chromosome number (basic, somatic and gametic). Karyotype of *Morus*. Gene banks. Germplasm banks.
- Chromosome banding; meiotic irregularities, chromosome associations during meiosis in polyploids. Plant and water relations. Source and sink relationship; Apoplast and symplast movements.

- Anther culture, pollen culture, ovule culture, Bulbasum technique; detection of haploids; applications of haploids in mulberry breeding. Somatic hybridization. Pureline breeding, hybridization, polyploidy breeding in mulberry.

UNIT- 07: SILKWORM PHYSIOLOGY, BREEDING AND GENETICS

UNIT 07-A: SILKWORM PHYSIOLOGY

- Muscle Physiology: flight muscles in insects, ultra structure of skeletal muscle, mechanism of muscle contraction.
- Neurophysiology: Insect nervous system, structure of the neuron. Neurochemistry and physiology. Receptor Physiology: photoreceptors – compound eyes, mechanism of image formation, chemoreceptors
- Genetics of voltanism and moultinism. Heterosis. Cocoon colour, sex determination in silkworm.

UNIT 07-B: SILKWORM BREEDING AND GENETICS

- Classification of insecticides and acaricides: Based on mode of entry, mode of action and chemical nature. Insect growth regulators: Microbials, botanicals, new. Insect growth regulators. LC-50 and LD- 50 values.
- Heritability studies in *Bombyx mori.* Race authorization system of India. Sex limited breeds. Z & W Chromosome. Pleiotropism. Quantitative trait loci (QTL). Silkworm breeding organization in India and China.
- Mosaicism: Linkage and crossing over: Linkage groups in Drosophila and *Bombyx mori.* Classical linkage map of *Bombyx mori*. Radiation and chemical mutagenesis in silkworm.

UNIT- 08: MILBERRY AND SILKWORM CROP PROTECTION

UNIT 08-A: MILBERRY & SILKWORM DISEASES

- Diseases of mulberry: fungal, bacterial, viral, nematode and mineral deficiency diseases.
- Diseases of silkworm: fungal, bacterial, viral (BmNPV, BmCPV, DNV and IFV), microsporidian or protozoan (pebrine).
- Pests of mulberry: major and minor [pests, key pests and their management. Pests of silkworm: Dermestid beetle, uzi fly and control measures.

UNIT 08-B: PESTS OF MULBERRY & SILKWORM

- Disease cycle of mulberry diseases: extent of damage, crop loss and characteristic symptoms.
- Biological pest control of silkworm pests: life cycle and control measures of *Exorista bombycis*.
- Integrated Pest Management in sericulture. Common pests and rodents of cocoon storage and grainage houses.

UNIT-09: ENTREPRENEURSHIP, COMPUTER AND BIOSTATS

UNIT 09-A: ENTREPRENEURSHIP DEVELOPMENT PROGRAMME

- Entrepreneurship Development policies of Central Silk Board and other sericultural organizations. EDP in raising mulberry saplings (Kisan nursery), vermicomposting, chawki rearing centres, egg production and in silk reeling.
- Biography of Indian Entrepreneurship, Special schemes for technical entrepreneurs (STED).
- Mass production of insect pathogens; Mass production of parasitoids and predators.

UNIT 09-B: COMPUTER AND BIOSTATS

- History and evolution, generation and types of computers. World Wide Web, database, e-mail and chat. M.S. Office: Word, Excel and Power Point.
- Descriptive and inductive statistics, discrete and continuous variable; Frequency distribution.
- Linear correlation and regression. Tests of significance: students't', chi-square, and 'F' tests, tests.

UNIT-10: POST COCOON TECHNOLOGY

UNIT 10-A: TEXTILE FIBERS

- Textile fiber: Introduction and classification of textile fibers. Physical and chemical properties of silk, wool, cotton, and synthetic fibers. Different types of silk: tassar, muga and eri and their properties.
- Silk exchanges-Structure and function. Defective cocoons & their by-products & silk and its uses. shell ratio %, filament length, filament size reelability %, Renditta, raw silk %, Kakame cost.
- Cocoon Stifling: Cocoon Cooking; Cocoon brushing; Reeling and its objectives: Charka, Cottage basin, multi-end, automatic and semiautomatic machines.

UNIT 10-B: SILK REELING TECHNOLOGY

- Re-reeling and finishing: Raw silk testing and grading: Raw silk tests-visual, mechanical tests.
- Wet processing: Degumming its methods; Bleaching its. Dyeing- Principles and methods of dyeing, Dyeing of silk with natural dyes.
- Weaving: Preparation of warp and weft. Spun silk- Raw material -hand spinning -Spun silk industry.

Syllabus for filling up the posts of Assistant professor (ENVIRONMENTAL SCIENCES) in Higher Education Department (JKPSC-2023)

1. Ecology and biodiversity

Introduction to ecology and ecosystem, Terrestrial ecosystems (Landscape, Forest and agro-ecosystem), Aquatic ecosystems (Freshwater, Stream and river, Lakes and wetland), Biomes: Concept, classification, distribution and characteristics, Biogeochemical cycles, Primary and secondary productivity, Principles of limiting factors, Concept of biotic community, Population characteristics and dynamics, Population structure and interactions, Biodiversity: Status and importance, India as a mega-diversity nation, Endemism, Hot Spots and cold spots, Concept of native and exotic species, Biodiversity decline, Threatened species categories of IUCN, Biodiversity conservation (*In-situ* and *Ex-situ*).

2. Environmental pollution

Sources, classification and properties of primary and secondary air pollutants, Impact of air pollution on human health and environment, Smog and acid rain, Ozone layer depletion, Air quality standards and indices, Control of particulate and gaseous air pollution - SOx, NOx, CO, Control of greenhouse gases, Bio-filters for control of air pollution, Noise pollution: definition and sources, Measurement of noise levels, Noise indices, Impact of noise on human health and environment, Noise control and abatement measures, Electromagnetic pollution in indoor and outdoor environment, Radiation exposure and impact on Human beings, Sources and management of Municipal solid waste, Biomedical waste, Hazardous waste, Industrial waste and E-waste, Sources, impact and management of soil pollution, Sources and types of water pollution, water quality standards and indices, effect of water pollution on living beings, Sources, types, impact and control of marine pollution, Thermal pollution and its control, Eutrophication and restoration of lakes, Ground water contamination and control.

3. Environmental microbiology and biotechnology

Bioremediation: Types, factors affecting bioremediation, processes, White-rot fungus technology for hazardous waste treatment, *In-situ* bioremediation, Bioventing, Air sparging, Bioaugmentation, Alternate electron acceptors technology, Land farming, Bioscrubber, Vermitechnology, Composting, Types of phytoremediation, Factors affecting phytoremediation, Rhizo-remediation, Green Infrastructures, Constructed wetlands, Biodeterioration and its control, Status of communicable diseases in India, Epidemiology (reservoir of infection, communicability and control) of major air, soil, water and food borne diseases, Biofuels, Biohydrogen, Bioplastics, Biomining, Bioindicators and biosensors in environmental biomonitoring, Genetically modified organisms and biosafety, Health and Environmental concerns in waste water management, Wastewater treatment methods (Primary, secondary, tertiary).

4. Ecotoxicology, environmental chemistry and instrumentation

Definition, scope, goals and divisions of toxicology, Factors influencing toxicity, Dose-response relationship, Toxicological interactions, Route of toxicant uptake in human beings, Toxicity testing methods, General principles and types of biotransformation, Bioaccumulation, Bioconcentration and biomagnifications, Bioassay and its applications in toxicology, Antidotal procedures in toxicology, Chemical safety evaluation, Toxicokinetics, Toxicants as public health hazard, Ecological risk assessment and management, Ions, radicals and particulates in the atmosphere, Formation of inorganic and organic particulate matter, Thermo-chemical and photochemical reactions in the atmosphere, Volatile organic compounds (VOCs), Cycling of primary gaseous pollutants, Physico-chemical properties of water, Solubility of gases in water; dissolved gases in water - CO_2, O_2, H_2S, CH_4 and NH_3, Carbonate-bicarbonate system and redox potential, acid base, equilibria, Buffering capacity, Oxidation/reduction, Precipitation chemistry, Principles of coagulation, flocculation, filtration and sedimentation, Nutrients in water: Phosphorus and nitrogen, Inorganic and organic components of soil, Physico-chemical properties of soils, Soil biology, Basic concepts in analytical chemistry, sampling and analytical techniques for air, water and soil

quality monitoring. Principles and applications of: UV-Visible Spectrophotometer, FTIR, Flame photometer, ICP-OES, ICP-MS, AAS, HPLC, GC-MS, NMR, X-Ray diffraction, FTIR, Ion chromatograph, Compound microscope, SEM, TEM, Introduction to biostatistics: Sampling of data, Measures of Central Tendency, Measurements of deviation, Analysis of variance.

5. Atmospheric science and climatology

Composition and structure of atmosphere, insolation, heat budget, horizontal distribution of atmospheric pressure, factors controlling wind, Introduction to atmospheric science and air-sea interactions, Air masses and air fronts, Weather forecasting, Introduction, types, sources, transformation, geographical distribution and atmospheric effects of aerosols, Major climates of the world (Equatorial, Savanna, Hot desert, Mediterranean, Steppe), Classification of climate: Koppen's, Thornthwaite and Trewartha, Monsoon and climatic zones of India, Western disturbances, Indian Summer Moonsoon and climate of J&K , Paleo-climatology and climate change, Atmospheric general circulation, Ocean general circulation, Madden Julian oscillations (MJO), El-nino and southern oscillations (ENSO), Indian Ocean dipole (IOD), Chemical composition of aerosols, Dry and wet atmospheric deposition, LIDARS, SODARS, weather RADARS, WP-RASS, Self recording instruments, radiosondes, radiometersondes, ozone sonde, Satellite meteorology: visible and infrared radiometer and multi scanner radiometer, Climate hazards: fog and thunderstorms, Climate and human health, Climate and house types.

6. Environmental geoscience

Origin and evolution of earth, Composition and classification of Earth's interior, Basics of seismology, Types of seismic waves and their role in the study of Earth's interior, Geological time scale, Geomagnetism: Magnetic and gravitational fields of the earth, Magnetic reversal and magnetic anomalies, Continental drift theory, evidences and contradictions, Plate tectonics and Neo-tectonics, Theory of isostasy and global isostatic adjustment , Major rock types and their classification, Rock cycle, Types of folds and faults, Types of weathering, Volcanism, components and types of Volcanoes, volcanic material,

processes and effects of volcanism, Factors affecting the landform development, Geomorphological systems (Fluvial, Karst, Aeolian, Glacial).

7. Environmental impact assessment and disaster management

Environmental impact assessment: Concept and objectives, EIA process, Impact evaluation and prediction, EIA guidelines 2006 and amendments, Protocol for EIA, Environmental Impact Statement, Environmental Management Plan, Ecological and Social Impact Assessment, Environmental Impact Assessment of: River valley projects, Mining projects, Thermal power projects, Cement industry and oil refineries, Life Cycle Assessment, Eco-labeling, Environmental Auditing (ISO-14001), Environmental education, Ecotourism and its impact on environment and livelihood, Watershed management , Land use planning, Land capability and suitability classification, Concept and classification of natural hazards and disasters and causal factors, Biological, Chemical, and Nuclear disasters, Forest fires, Desertification, Causes and environmental consequences of Earthquakes, Tsunami, Floods, Droughts, Landslides, Avalanches, Heat and cold waves, Cyclones, Volcanic eruptions, Risk assessment and vulnerability analysis, Disaster mitigation and management: preparedness, response, relief and rehabilitation and disaster failures, National and State Disaster Management Policy.

8. Environmental economics and sustainable development

Definition and scope of Environmental economics, Linkage between environment, growth and economics, Economic growth versus sustainable development, Concept of intangibles, Market failures and externalities, Environmental evaluation methods: Travel cost, Hedonic pricing, contingent evaluation and Household production function, Carbon credits and trading, Common property resources: Tragedy and role of people in their management, Economic instruments for sustainable development, Ecological footprint, Environmental cost-benefit analysis, Sustainability and pillars of sustainability, Sustainable development goals, World Summit on sustainable development, Population, poverty and resource utilization, Resource conflicts: Extraction, access and control, Linkages between environment, population and development, Ecosystem services, Valuation and accounting

of Ecosystem services, Incentives for Ecosystem services (IES) in the Himalayas, Sacred groves, Environmental ethics and activism.

9. Environmental law and policies

Indian constitution and environmental protection, Provisions of constitution (Article 21, 48A, 51A, and 253), National efforts on environmental protection, International efforts for environment protection (Stockholm, Kyoto protocol, Paris agreement), CITES (1973), Earth Summit, Water (Prevention & Control of Pollution) Act (1974), Air (Prevention & Control of Pollution) Act (1981), Environmental Protection Act (1986), Indian forest Act (1927), Forest Conservation Act (1980) and Rules (1981), Wildlife Protection Act (1972) and amendments (1991, 2002) and J&K wildlife (Protection) Act (1978) and amendment (2002), Biological Diversity Act (2002), National Forest Policy (1988), National Environment Policy (2006), National Water Policy (2012), National Energy Policy (2017), National Mineral Policy (2019), National Green Tribunal Act (2010), Public Liability Insurance Act (1991), Intellectual Property Rights and Patent Act (2005), Indian Penal code (IPC 1960), Offences affecting public health, Safety and convenience (Sections 268, 277, 278, 279, 284, 290, 291), Hazardous Waste Management and Handling Rules (1989), Biomedical Waste (Management & Handling) Rules (1998), Noise Pollution (Regulations & Control) Rules (2000), Municipal Solid Wastes (Management & Handling) Rules (2000), E-waste (Management & Handling) Rules (2011), Plastic Waste Management Rules (2016), Powers and functions of SPCB and CPCB, Role of Indian Judiciary in Environmental protection, Millennium Development Goals (MDGs), National Action Plan on Climate Change (NAPCC).

10. Natural resource conservation and management

Concept and classification of natural resources, Factors influencing resource availability, Forest resources: Status, distribution and forest products, Priorities for conservation of plant resources, Wildlife as natural resource, Wildlife distribution in India, Man and wildlife conflict, Wildlife management principles, Protected area network (National parks, wild life

Sanctuaries and Biosphere reserves), Important conservation areas and wildlife species of J&K, Classification of mineral resources, Mineral resources in India with special reference to J&K, Economic minerals (iron, steel and the ferro alloy metals), Energy minerals (Coal, oil, natural gas, thorium and uranium), Global mineral distribution in oceans, Environmental impact of mineral resource exploitation, mining, processing and post-processing scenarios, Soil as natural resource: general account with reference to macro- and micro-nutrients and soil biota, Soil fertility, Global water footprint, Water resources of India with special reference to Jammu and Kashmir, Water and food security linkages, Animal and fishery resources of India, Forest resources of India: Timber and non-timber, Rangelands, Renewable energy resources, Non-renewable energy resources, Nuclear energy, Concept of green fuels, Hydrogen as a source of energy, Remote sensing and GIS applications in natural resource management.

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10. Natural resource conservation and management

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Sanctuaries and Biosphere reserves), Important conservation areas and wildlife species of J&K, Classification of mineral resources, Mineral resources in India with special reference to J&K, Economic minerals (iron, steel and the ferro alloy metals), Energy minerals (Coal, oil, natural gas, thorium and uranium), Global mineral distribution in oceans, Environmental impact of mineral resource exploitation, mining, processing and post-processing scenarios, Soil as natural resource: general account with reference to macro- and micro-nutrients and soil biota, Soil fertility, Global water footprint, Water resources of India with special reference to Jammu and Kashmir, Water and food security linkages, Animal and fishery resources of India, Forest resources of India: Timber and non-timber, Rangelands, Renewable energy resources, Non-renewable energy resources, Nuclear energy, Concept of green fuels, Hydrogen as a source of energy, Remote sensing and GIS applications in natural resource management.

Jammu and Kashmir Public Service Commission
Srinagar/Jammu

Syllabus for written examination for the Post of Assistant Professor in the subject of Physics

I. Mathematical Methods of Physics

Dimensional analysis; Vector algebra and vector calculus; Linear algebra, matrices, Cayley Hamilton theorem, eigenvalue problems; Linear differential equations; Special functions (Hermite, Bessel, Laguerre and Legendre); Fourier series, Fourier and Laplace transforms; Elements of complex analysis: Laurent series-poles, residues and evaluation of integrals; Elementary ideas about tensors. Functions of a complex variable, Cauchy Riemann equations, Harmonic functions, complex integration, Cauchy's integral formula.

II. Classical Mechanics

Newton's laws; Phase space dynamics, stability analysis; Central-force motion; Two-body collisions, scattering in laboratory and centre-of-mass frames; Rigid body dynamics, moment of inertia tensor, non-inertial frames and pseudoforces; Variational principle, Lagrangian and Hamiltonian formalisms and equations of motion; Poisson brackets and canonical transformations; Symmetry, invariance and conservation laws, cyclic coordinates; Periodic motion, small oscillations and normal modes. Hamilton-Jacobi equations for Hamilton's characteristic function.

III. Electromagnetic Theory

Electrostatics: Gauss' Law and its applications; Laplace and Poisson equations, boundary value problems; Maxwell's equations in free space and linear isotropic media; boundary conditions on fields at interfaces; Scalar and vector potentials; Gauge invariance; Electromagnetic waves in free space, dielectrics, and conductors; Dispersion relations in plasma; Lorentz invariance of Maxwell's equations; Transmission lines and wave guides; Dynamics of charged particles in static and uniform electromagnetic fields; Radiation from moving charges, dipoles and retarded potentials, Linard-Wiechert potentials.

IV. Quantum Mechanics

Wave-particle duality; Wave functions in coordinate and momentum representations; Commutators and Heisenberg's uncertainty principle; Matrix representation; Dirac's bra and ket notation; Schroedinger equation (time-dependent and time-independent); Eigenvalue problems such as particle-in-a-box, harmonic oscillator, etc.; Tunneling through a barrier; Motion in a central potential; Orbital angular momentum, Angular momentum algebra, spin; Addition of angular momenta; Hydrogen atom, spin-orbit coupling, fine structure; Time- independent perturbation theory and applications; Variational method; WKB approximation; Time dependent perturbation theory and Fermi's Golden Rule; Selection rules; Semi-classical theory of radiation; Elementary

theory of scattering, phase shifts, partial waves, Born approximation; Identical particles, Pauli's exclusion principle, spin-statistics connection; Relativistic quantum mechanics: Klein Gordon and Dirac equations.

V. **Thermodynamic and Statistical Physics**

Phase space, micro- and macrostates; Microcanonical, canonical and grand-canonical ensembles and partition functions; Free Energy and connection with thermodynamic quantities; Gibb's paradox. First- and second-order phase transitions, Mean field theory, Landau's theory. Classical and quantum statistics, ideal Fermi and Bose gases; Blackbody radiation and Planck's distribution law; Bose-Einstein condensation; Random walk and Brownian motion; Introduction to nonequilibrium processes; Diffusion equation.

VI. **Electronics**

Semiconductor device physics, including diodes, junctions, transistors, field effect devices, homo and heterojunction devices, device structure, device characteristics, frequency dependence and applications; Optoelectronic devices, including solar cells, photodetectors, and LEDs; High-frequency devices, including generators and detectors; Operational amplifiers and their applications; Digital techniques and applications (registers, counters, comparators and similar circuits); A/D and D/A converters.one bit memories; RS, JK, JK-master-slave, D and T Flip Flops.

VII. **Computational methods in physics**

Numerical analysis: Elements of computational techniques; interpolation and extrapolation, Lagrange's interpolation, roots of functions; Bisection method, secant method, numerical integration; Trapezoidal rule, Simpson's $1/3^{rd}$ rule, solutions of first order differential equation by Runge-Kutta method. Solutions of algebraic and transcendental equations; Newton-Raphson method, solution of linear system of equations by Gauss Elimination method.

VIII. **Atomic & Molecular Physics**

Quantum states of an electron in an atom; Electron spin; one electron atoms, Relativistic corrections for energy levels of hydrogen; Hyperfine structure and isotopic shift; width of spectral lines; LS & JJ coupling; Zeeman, Paschen Back & Stark effect; X-ray spectroscopy; Electron spin resonance, Nuclear magnetic resonance, chemical shift; Rotational, vibrational, electronic, and Raman spectra of diatomic molecules; Frank – Condon principle and selection rules Spontaneous and stimulated emission, Einstein A & B coefficients;

IX. **Condensed Matter Physics**

Bravais lattices; Reciprocal lattice, diffraction and the structure factor; Bonding of solids; Elastic properties, phonons, lattice specific heat; Free electron theory and electronic specific heat; Response and relaxation phenomena; Drude model of electrical and thermal conductivity; Hall effect and thermoelectric power; Diamagnetism, paramagnetism, and ferromagnetism; Electron motion in a periodic potential, band theory of metals, insulators and semiconductors; Superconductivity, type – I and type - II superconductors, Josephson junctions; Defects and dislocations; Ordered phases of matter, translational and orientational order, kinds of liquid crystalline order; Conducting polymers; Quasicrystals.

X. Nuclear and Particle Physics

Basic nuclear properties: size, shape, charge distribution, spin and parity; Binding energy, semi-empirical mass formula; Liquid drop model; Fission and fusion; Nature of the nuclear force, form of nucleon-nucleon potential; Charge-independence and charge-symmetry of nuclear forces; Isospin; Deuteron problem; Evidence of shell structure, single- particle shell model, its validity and limitations; Rotational spectra; Elementary ideas of alpha, beta and gamma decays and their selection rules; Nuclear reactions, reaction mechanisms, compound nuclei and direct reactions; Classification of fundamental forces; Elementary particles (quarks, baryons, mesons, leptons); Spin and parity assignments, isospin, strangeness; Gell-Mann- Nishijima formula; C, P, and T invariance and applications of symmetry arguments to particle reactions, parity non-conservation in weak interaction.

Jammu and Kashmir Public Service Commission
Srinagar/Jammu

Syllabus for written examination for the Post of Assistant Professor in the subject of Electronics

UNIT – I

Introduction to semiconductors, energy bands in solids, concept of effective mass, density of states, Fermi levels. PN junction, diode equation and diode equivalent circuit, breakdown in diodes, Zener diode, Tunnel diode, metal semiconductor junction – Ohmic and Schottky contacts, characteristics and equivalent circuits of JFET, MOSFET, low dimensional semiconductor devices – quantum wells, quantum wires, quantum dots, high electron mobility transistor (HEMT), solar cells – I-V characteristics, fill factor and efficiency, LED, LCD, and flexible display devices, emerging materials for future devices: graphene, carbon nano tubes (CNT), ZnO, SiC, etc.

UNIT – II

IC fabrication – crystal growth, epitaxy, oxidation, lithography, doping, etching, isolation methods, metallization, bonding, thin film deposition and characterization techniques: XRD, TEM, SEM, EDX, thin film active and passive devices, MOS technology and VLSI, scaling of MOS devices, NMOS and CMOS structures and fabrication, characteristics of MOS transistors and threshold voltage, NMOS and CMOS inverters, charge-coupled device (CCD) – structure, charge storage and transfer, basics of VLSI design, stick diagrams, layout design rules.

UNIT – III

Superposition, Thevenin, Norton, and maximum power transfer theorems, network elements, network graphs, nodal and mesh analysis. Laplace transform, Fourier transform and Z-transform, time and frequency domain response, passive filters, two-port network parameters: Z, Y, ABCD and h parameters, transfer functions, signal representation, state variable method of circuit analysis, AC circuit analysis, transient analysis, zero and poles, Bode plots, continuous time signals, Fourier series and Fourier transform representations, sampling theorem and applications, discrete time signal, discrete Fourier transform (DFT), fast Fourier transform (FFT), basic concepts of digital signal processing, digital filters – IIR, FIR.

UNIT – IV

Rectifiers, voltage regulated ICs and regulated power supply, biasing of bipolar junction transistors and FETs, operating point and stability, amplifiers, classification of amplifiers, concept of feedback, Hartley, Colpitt's and phase shift oscillators, Operational Amplifiers (OPAMP) - characteristics, computational applications, comparators, Schmitt trigger, instrumentation amplifiers, wave shaping circuits, phase locked loops, active filters, multivibrators, voltage to frequency convertors (V/F), frequency to voltage convertors (F/V).

UNIT – V

logic families, logic gates, Boolean algebra and minimization techniques, combinational circuits, programmable logic devices (PLD), CPLD, flip-flops, memories, sequential circuits: counters – ring, ripple, synchronous, asynchronous, shift registers, multiplexers and demultiplexers, A/D and D/A converters, analysis and design of fundamental mode state machines: state variables, state table and state diagram. sequential PLD, FPGA, analysis and design of digital circuits using HDL.

UNIT – VI

Introduction of Microprocessor 8086: architecture, addressing modes, instruction set, interrupts, programming, memory and i/o interfacing, introduction of microcontrollers – 8051 for embedded systems, architecture and register set of microcontroller 8051, addressing modes, instruction set of 8051 – data transfer instructions, arithmetic instructions, logic instructions, bit level and byte level control transfer instructions, 8051 assembly programming – stack operations, subroutines, interrupts, 8051 programming as timer/counter, 8051 serial communication, 8051 interfacing RS232, LED/LCD display, keyboard, stepper motor.

UNIT – VII

Electrostatics - vector calculus, Gauss's Law, Laplace and Poisson's equations, magnetostatics – Biot Savert's law, Ampere's law and electromagnetic induction, Maxwell's equations and wave equations, plane wave propagation in free space, dielectrics and conductors, poynting theorem, reflection and refraction, polarization, interference, coherence and diffraction, transmission lines and waveguides – line equations, impedance, reflections and voltage standing wave ratio, rectangular waveguides. antennas – retarded potential and Hertzian dipole, half wave antenna, antenna patterns, radiation intensity, gain, effective area and Frii's free space receiver power equation, microwave sources and devices -reflex klystron, magnetron, TWT, Gunn diode, IMPATT diode, crystal detector and PIN diode, radar – block diagram of radar, frequencies and power used, radar range equation.

UNIT – VIII

Analog modulation and demodulation - AM, FM and PM, principle of super heterodyne receiver, random signals, noise, noise temperature and noise figure, basic concepts of information theory, error detection and correction, digital modulation and demodulation – PCM, ASK, FSK, PSK, BPSK, QPSK and QAM, time and frequency-division multiplexing, multiple access techniques, data communications – modems, codes, principles of mobile and satellite communication, optical communication, optical sources - LED, spontaneous and stimulated emission, semiconductor lasers, detectors – PIN photodiodes, avalanche photodiodes (APD), optical fibers – attenuation and dispersion characteristics, bandwidth, wavelength division multiplexing, fundamentals of internet of things (IoT) for communication.

UNIT – IX

Power devices – characteristics of SCR, DIAC, TRIAC, power transistors, protection of thyristors against over voltage and over current. SCR triggering - dv/dt and di/dt, triggering with single pulse and train of pulses, AC and DC motors - construction and speed control, switched mode power supply (SMPS), uninterrupted power supply (UPS), open loop and closed loop control system, block diagram reduction techniques, transfer function and signal flow diagram, stability criterion: Routh Hurwitz and Nyquist plot, on-off controller, proportional (P), proportional-integral (PI), proportional-derivative (PD), PID controllers.

UNIT – X

Transducers – resistance, inductance, capacitance, piezoelectric, thermoelectric, Hall effect, photoelectric, measurement of displacement, velocity, acceleration, force, torque, strain, temperature, pressure, flow, humidity, thickness, pH. measuring equipment – measurement of R, L and C, bridge and potentiometers, voltage, current, power, energy, frequency/time, phase, digital multimeters, CRO, digital storage oscilloscope, spectrum analyzer., biomedical instruments – ECG, EEG, blood pressure measurements, MEMS and its applications sensors for IoT applications.

UT OF JAMMU AND KASHMIR

PUBLIC SERVICE COMMISSION

SYLLABUS FOR SCREENING TEST OF ASSISTANT PROFESSOR

SUBJECT: MASS COMMUNICATION AND JOURNALISM

Unit 1: Introduction to Mass Communication

- Historical evolution of Mass Communication
- Forms of Communication, Communication Barriers
- Theories of Mass Communication
- Normative Theories of Media
- Theories of Propaganda and Persuasion
- Major Communication models: linear, interactive, transactional.
- Media Functions for Individuals and Society
- Mass Media Audience

Unit 2: Media and Society

- Media and Cultural Imperialism
- Media and Democracy
- Media and the Public Sphere
- Global media flow and Media Imperialism
- Media Ownership and concentration of media power
- Construction of Reality by Media
- Media representation of gender, race, ethnicity
- Media and Social Change

Unit 3: Journalism and News Writing

- Types of Journalism: Print, Broadcast, Online
- News values and news judgement
- News gathering and reporting techniques
- News headlines and their purpose
- News writing: lead, inverted pyramid, feature, and opinion writing
- Newsroom technologies and their impact on journalism
- Newspaper terminology
- Citizen journalism and its role in news reporting

Unit 4: Broadcast Journalism and Production

- History of Broadcast Journalism
- Television and Radio news production
- Types of news broadcasts: newscasts, breaking news, feature stories, investigative reports, and documentaries
- Elements of a news broadcast: script, visuals, sound, graphics, and music
- Interviewing techniques for broadcast journalism
- Roles and responsibilities of broadcast journalists: anchors, reporters, producers, and editors
- Visual storytelling and multimedia production
- Technology and innovation in broadcast journalism: satellite news gathering, mobile journalism (MOJO) and virtual reality

Unit 5: Advertising and Public Relations

- Advertising: History, Development, and Theories
- Advertising Strategies and Tactics
- Advertising media planning and buying: Reach, Frequency, and Media Selection
- Types of Advertising: Product, Corporate, and Social Advertising
- Advertising Research and Evaluation
- Public Relations: History, Development, and Theories
- Public Relations tactics: Media Relations, Crisis Communication, and Event Management
- Advertising and Public Relations regulations: Industry Self-Regulation, Government Regulation, and International Regulation

Unit 6: Media Law and Ethics

- Freedom of Expression and Press Freedom
- Media regulations and Censorship
- Fair use doctrine and Copyright law
- Media and Defamation law
- Ethics in media and journalism: Privacy, Confidentiality, and Conflict of Interest
- Shield laws and Reporter's Privilege
- Cable Television Network Regulation Act
- Film Censorship

Unit 7: Media Management

- Media Economics and Revenue Models
- Monopoly and media concentration
- Media planning and management
- Media distribution and syndication
- Media and audience measurement
- Media marketing and branding
- Audience research and media analytics
- Media convergence and innovation

Unit 8: Digital Media and New Technologies

- Social media and Online Communities
- Mobile and emerging technologies
- Digital storytelling and multimedia journalism
- Data journalism and visualization
- Cybersecurity and data protection in digital media.
- Role of artificial intelligence in journalism and media production
- Digital media and privacy concerns
- Information Overload

Unit 9: Media Research

- Introduction to Research Methods, Types of Research - Qualitative and Quantitative
- Research Design, Sampling techniques
- Mixed Methods Research, Triangulation of data
- Critical theory and critical research methods
- Data Collection Methods: Primary and secondary data sources, Questionnaire, Interview, Observation
- Data Analysis and Interpretation:
- Ethics in Research, Plagiarism and copyright issues
- Writing Research Reports, Citation styles and referencing

Unit 10: Film Studies

- Film as a medium of communication, Film history and evolution
- Film theory, genres and styles
- Indian Cinema before and after Independence
- Cinematic language
- Writing for Cinema
- Script Writing
- Film and Society
- Film Criticism and Analysis

THE SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR IN THE FOLLOWING SUBJECTS IS SAME AS PRESCRIBED FOR UGC-NET EXAMINATION:

1. HINDI.
2. TOURISM & TRAVEL.
3. URDU

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR ZOOLOGY

UNIT-1: BIOMOLECULES AND THEIR INTERACTION

Structure of atoms, molecules and chemical bonds, Stablizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.). Proteins: Levels of organization, Primary, Secondary, Teritiary, Quaternary, General properties and classification., Denaturation, Carbohydrates: General features and classification, Saturated & Unsaturated fatty acids, lipids triacylglycerols, waxes, Phospholipids, Glycolipids, Steroids, Lipoprotein, Prostaglandins, Conformation of nucleic acids (helix (A, B, Z), t-RNA, micro-RNA, Glycolysis, Glycogenesis, Glycogenolysis & Gluconeogenesis, Citric acid cycle, Fatty acid oxidation, Coenzymes and their types, Isoenzymes, Inhibition of enzyme activity Irreversible inhibition, Reversible inhibition, Competitive, Non-competitive, Uncompetitive, Feedback inhibition: Allosteric site – a concept, Allosteric inhibition,

UNIT-2: FUNDAMENTAL PROCESSES

Unit of replication, enzymes involved, replication origin and replication fork, the fidelity of replication, extra-chromosomal replicons, DNA damage and repair mechanisms, RNA synthesis and processing, Transcription factors and machinery, the formation of initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination, RNA processing, RNA editing, splicing, polyadenylation, structure, and function of different types of RNA, Protein synthesis and processing: Ribosome, the formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, translational proof-reading, translational inhibitors, post-translational modification of proteins, Control of gene expression at transcription and translation level

UNIT-3: ECOLOGY AND ENVIRONMENTAL PROCESSES

The Environment: Physical environment; biotic environment; biotic and abiotic interactions. Habitat and Niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement. Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and k selection); concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations. Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis. Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. Ecological Succession: Types;

mechanisms; changes involved in succession; concept of climax. Trophic pyramids and food webs.

UNIT-4: GENETICS AND INHERITANCE BIOLOGY

Structure of chromatin: heterochromatin, euchromatin, Nucleosome model, Chromosome structure: Prokaryotes, Eukaryotes, Telomere structure, Centromere, Kinetochore, Specialized chromosomes: Lampbrush chromosomes, Polytene chromosomes, Mitochondrial Genome and Chloroplast Genome Numerical and structural chromosomal Variations in Human, Numerical Changes and their genetic implications , Polyploidy, Aneuploidy, Numerical Change associated disorders in humans, Structural chromosome alterations: Deletions, Duplications, Inversions, Translocations, Structural changes associated disorders in humans, Mutation : Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis

UNIT-5: CELLULAR ORGANIZATION

Membrane structure and function (Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes). Structural organization and function of intracellular organelles, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, vacuoles. Operon, unique and repetitive DNA, interrupted genes, gene families, structure of chromatin and chromosomes, heterochromatin, euchromatin, Cell division, cell cycle (Mitosis and meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle)

UNIT-6: CELL SIGNALLING AND IMMUNOLOGY

Cell signaling: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, Cellular communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation. Cancer Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, apoptosis, Immune cells and organs of immune system, Primary, Secondary and Tertiary tissues and organs of immune system, B-Lymphocytes and T-Lymphocytes, Antibody: Types, Structure.

UNIT-7: ANIMAL PHYSIOLOGY

Animal Nutrition: Modes of animal nutrition, Digestion and its control, Salivary digestion, Gastric digestion , Intestinal digestion and digestion enzymes, Absorption in Gastro-intestinal tract: Carbohydrates, Amino acids, Lipids and other substances, Blood: Composition and Functions, Blood coagulation, Blood groups and transfusion, Heart and its working, Heart Beats (in mammals), Origin, rhythmicity and conduction, Nervous regulation, Chemical regulation, Electro-cardiogram, Cardiac cycle in man, The exchange vessels, Respiration, Nervous regulation of respiration (in mammals), Excretory physiology (in mammals), Detailed structure of nephron, Glomerular functions, Tubular functions, The rennin angiotensins, Aldosterone system, Nerve impulse origin and propagation, ion channels, Synapsis and transmitters, Endocrinology and reproduction - Endocrine glands, basic mechanism of hormone action, hormones and diseases.

UNIT-8: EVOLUTIONARY BIOLOGY

Lamarck; Darwin–concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; Spontaneity of mutations; Origin of cells and unicellular evolution: Origin of basic biological molecules; Abiotic synthesis of organic monomers and polymers, Concept of Oparin and Haldane; Experiment of Miller; The first cell; Evolution of prokaryotes; Origin of eukaryotic cells, Evolutionary time scale: Eras, period and epoch, Population genetics – Populations, Gene pool, Gene frequency; Hardy-Weinberg Law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift; Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; Convergent evolution; Sexual selection; Co-evolution; Stages in primate evolution including Homo; Altruism and evolution-Group selection, Kin selection, Reciprocal altruism

UNIT-9: DEVELOPMENTAL BIOLOGY

Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; gonadotropin: types and functions, Sex steroids : Biosynthesis & Role in Reproduction, Corpora lutea, their structure and function, Atresia: formation and significance, Spermatogenesis: Process, Ultra structure of sperms, Spermiogenesis, Oogenesis: Process, Vitellogenesis, Types of eggs and Egg membranes, Fertilization process, Capacitation, Recognition between male and female gamete, Acrosome reaction of sperm, Cortical reaction of egg, Sperm penetration into egg, Amphimixes, Menstrual cycle, Cleavage and blastulation, Characteristics and Mechanism of cleavage, Patterns of cleavage, Types of blastula, factors involved in shaping the blastula (Blastulation in sea urchin, frog), Gastrulation, Process of gastrulation, Metamorphosis in Amphibians, axes and pattern formation in *Drosophila*, organogenesis – vulva formation in *Caenorhabditis elegans*.

UNIT-10: ANIMAL DIVERSITY

Invertebrates: General characters and classification up to order level. Locomotion in Protozoa. Canal system in *Sycon*. Polymorphism in Hydrozoa. Parasitic adaptations in roundworms, Metamerism of Annelids, Social organization in insects-Honey bee, Torsion of Mollusca. Water vascular system in Asteroidea. Retrogressive Metamorphosis in Urochordata, Vertebrates: General charac rs and classification up to class level. Scales in fishes. Flight adaptations in birds. Plankt n and benthos: definition, classification and its role in fishery. Concept and Types of Syn biotic Relationships. Types of Parasite. Vectors and Hosts.

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR SOCIOLOGY IN HIGHER EDUCATION DEPARTMENT

SUBJECT: **SOCIOLOGY**

SYLLABUS

Unit 1: Basic concepts in Sociology.

1. Emergence of Sociology & Basic Concepts.
   a. Origin of Sociology
   b. Meaning, Nature & Subject matter
   c. Community, Institution, Association & Society.
   d. Social Groups, Norms & Values.
   e. Sociological Perspectives.
2. Social Structure:-
   a. Status & Status Set.
   b. Role & Role Set.
   c. Multiple Role.
   d. Role Conflict.
   e. Bureaucracy, Power & Authority.
3. Social Institutions:
   a. Family
   b. Marriage
   c. Kinship
   d. Economy
   e. Religion
4. Social Processes
   a. Socialization
   b. Social Change
   c. Social Conflict
   d. Social Mobility
   e. Social Control

5. Social Stratification
    a. Social Differentiation, Hierarchy & Inequality
    b. Caste & Class
    c. Gender, Sexuality & Disability
    d. Race, Tribe & Ethnicity

Unit-II Sociological Theory.

1. Classical Sociological Traditions
    a. Emile Durkheim
    b. Max Weber
    c. Karl Marx
    d. Vilfredo Pareto
2. Structural Functionalism & Structuralism.
    A. Bronislaw Malisnowski
    B. A.R. Radcliffe Brown
    C. Talcott Parsons
    D. Robert K. Merton
    E. Claude Levi Strauss.
3. Hermeneutics & interpretative traditions
    a. G.H. Mead
    b. Karl Mannheim
    c. Harold Garfinkel
    d. Erving Goffman
    e. Clifford Geertz
4. Post Modernism, Post Structuralism and Post Colonialism
    a. Edward Said
    b. Pierse Bourdieu
    c. Michel Foucault
    d. Jurgen Habermas
    e. Anthony Giddens
    f. Manuel Castells.
5. Indian thinkers
    a. M.K. Gandhi
    b. B.R. Ambedkar
    c. Radha Kamal Mukherjee
    d. G.S. Ghurye

e. M.N. Srinivas
f. Irawati Karve

Unit III Research methodology

1. Conceptualizing social reality
   a. Philosophy of science
   b. Scientific Method & Epistemology in Social Science
   c. Hermeneutic Tradition
   d. Objectivity & Reflexivity in Social Science
   e. Research Ethics
2. Formulating Research Design
   a. Types of Research Design
   b. Induction & Deduction
   c. Fact, Concept & Theory
   d. Hypothesis, Research Questions & Objective
3. Qualitative & Quantitative Research
   a. Ethnography
   b. Survey Method
   c. Historical Method
   d. Comparative Method
   e. Content Analysis
4. Techniques
   a. Sampling
   b. Scaling
   c. Questionnaire & Schedule
   d. Observation, Interview & Case Study
5. Data Analysis
   a. Coding, Editing & Tabulation
   b. Statistical Analysis
   c. Interpretation & Data Analysis
   d. Bibliography & Report Writing.

Unit-IV Rural & urban societies

1. Understanding Rural Societies
   a. Basic features of Rural Society

b. Village: Definition & Types
c. Land Ownership & Agrarian Relation
d. Agrarian Social Structure & Emergent Class Structure.

2. Rural Movements & Development Programme
   a. Agrarian Unrest & Peasant Movements
   b. Decline of Agrarian Economy, De-peasantization & Migration
   c. Community Development Programme & Land Reforms
   d. Panchayati Raj Institution, Co-operatives & Self Help Groups.
3. Understanding Urban Society
   a. Urban, Urbanism & Urbanization.
   b. Towns, Cities & Megacities
   c. Industry, Service & Business
   d. Neighbourhood, Slums & Ethnic Enclaves.
4. Urban problems:
   a. Human Migration & Urban Cult
   b. Urban Poverty , Environment & Housing
   c. Urban Movements & Violence
   d. Urban Governance.

Unit-V Family, Marriage & Kinship

1. Understating Kinship
   a. Defining Kinship
   b. Kinship Usages
   c. Kinship Terminology
   d. Decent & Inheritance
2. Marriage & Affinity
   a. Meaning & Evolution
   b. Alliance Theory
   c. Marriage Transaction
   d. Rules Of Residence
3. Family
   a. Structure & Function
   b. Incest Taboo
   c. Theoretical Perspectives
   d. Emergent Forms Of Family

4. Emerging Trends
    a. Changing marriage Practices
    b. Gender Relations & Power Dynamics
    c. Family Laws
    d. New Reproductive Technologies & Surrogacy.

Unit-VI Environment & Sustainable Development

1. Concepts & Issues
    a. Environmental Sociology
    b. Social & Human Ecology
    c. Environmentalism
    d. Global Issues: Global Warming, Biodiversity Laws, Climate Change
2. Theoretical Approaches
    a. Classical Sociological Traditions
    b. New Ecological Paradigm
    c. Risk Theory
    d. Ecological Modernization Theory
3. Sustainable Development
    a. Meaning & Emergence
    b. Components of Sustainable Development
    c. Earth Summit
    d. Sustainable Development Goals
4. Environmental Movements & Issues.
    a. Forest Based Movements
    b. Land Based Movements
    c. Water Based Movements
    d. Role of Government & Non-Government Organizations.

Unit VII Indian Society

1. Conceptualizing Indian Society
    a) Evolution of Indian Society
    b) People of India: Groups and Communities

c) Unity in Diversity
d) Emergence of Ethnic Identities

2. Caste System in India
   a) Varna & Jati
   b) Caste System: Nature & Features
   c) Changes in Caste System
   d) Caste & Class Convergence
3. Theoretical Perspective
   a) Indological/Textual
   b) Structural-Functional
   c) Marxian
   d) Civilizational
   e) Subaltern
4. Process of Change in Indian Society
   a) Modernization & Globalization
   b) Problem of Minorities
   c) Reservation Policy: SC, ST, OBC & Women
   d) Tribal Unrest

Unit VIII Society, Economy & Politics

1. Understanding Economy & Society
   a) Exchange, Golf, Capital Labour & Market
   b) Mode of Production Debate
   c) Models of Economic Development
   d) Property & Property Relations
   e) Commodification of Rituals
2. Politics & Society
   a) Tribe, Nation State & Border
   b) Governance & Development
   c) Bureaucracy
   d) Public Policy
3. Social Movements & Protests
   a) Political Factors & Pressure Groups

b) Movements based on Caste, Ethnicity, Ideology, Gender & Religion.
c) Reservation & Politics.
d) Civil Society & Citizenship.

4. Changing Economy
   a) Poverty & Exclusion
   b) Changing Labour Relation
   c) Digital Economy & Ecommerce
   d) Consumerism & Consumption

Unit IX Sociology of Change & Development

1. Understanding Development
   a) Concept of Social Development
   b) Evolution & Diffusion
   c) Development & Progress
   d) Modernization & Development

2. Perspectives on Development
   a) Liberal
   b) Capitalist
   c) Socialist
   d) Gandhian
   e) Gender & Development
3. Science, Technology & Development
   a) History of Technological Development
   b) State Policy, Digital Divide & Inclusion
   c) E-Governance, Surveillance Society & Cyber Crime
   d) Food & Technology
   e) Virtual Community

4. Critiques of Development
   a) Development & Displacement
   b) Indian Experience of Development
   c) Current Debates in Development
   d) Social Exclusion & Inclusive Policy

Unit X Culture & Symbolic Transformation

1. Understanding Culture
   a) Culture: Concept & Types
   b) Determination of Culture
   c) Cultural Lag, Ethnocentrism & Xenocentrism
   d) Cultural Identity & Mobilization
2. Cultural & Everyday Life
   a) Culture & Politics
   b) Sports & Culture
   c) Gender, Body & Culture
   d) Culture & Environmentalism
3. Cultural Processes
   a) Acculturation
   b) Assimilation
   c) Enculturation
   d) Integration
4. Symbolic Transformations
   a) Signs & Symbols
   b) Rituals, Beliefs, Practices
   c) Ethics & Morality
   d) Religion & Economy
   e) New Religions Movement

BIOINFORMATICS

UNIT 1-

Basics of computer: History and development of computers; generations of computers; (I, II, III, IV and V), classifications of computers; analog computers, digital computers, mainframe computers, miniframe computers, microcomputers, fundamentals of logical concepts. Digital Computers:- Operation of digital computers, structure of digital computers; arithmetic unit, central unit, memory unit, Input unit and output Computer Coding:- Number system, decimal number system, binary number system, binary to decimal conversion, Binary arithmetic, octal number system, hexadecimal number system. Languages and flow charts and Operating Systems:-Machine level languages, assembly level languages, high level languages. Input and Output devices :- Punched card reader, paper tape reader, magnetic tape, floppy disk, magnetic disk, optimal scanner, voice data, entry terminal, teleprocessing terminal, visual display unit,modern input devices, Output devices; CRT, printer, plotter. Memory: - Primary memory or main memory; magnetic core memory, semi-conductor memory, RMA, ROM, PROM, EPROM, EEPROM. Secondary memory or auxillary memory or storage devices; Hard disk, discket, magnetic tape, ZIP, devices, digital tape,CD-ROM, DVD, virtual , memory, catche memory. Operating Systems:- DOS, windows 98/XP/VISTA, UNIX/LINUX, Mac OS, VMS. Modern Computers, Workstations, parallel processing computers, supercomputers. Internet and related programmes: - WWW, HTML, HTTP, telnet, FTP, computer domain.

Introduction to Biostatistics: Applications and uses, sample variable, statistical sampling, population, primary and secondary data, screening and representation of data. frequency distribution, bar diagram, histogram. Pie diagram, cumulative frequency curves. Mean, median, mode, Comparision between mean, median and mode. Measures of dispersion: range, variation, standard deviation, coefficient of variation, symmetry, probability distribution.

Basic Mathematics: Finite set, infinite set, null or void set, subset, Intervals; closed and open, universal set, operations of set. Relations and functions. Types of matrices, properties of matrices, addition, substraction of matrices, matrix, multiplication, elementary transformation, inverse of matrices. Determinants, properties associated with determinants. Trignometry and Derivatives.

Cell and Molecular Biology: Structural organization of prokaryotic and eukaryotic cells, Biomembranes- Structural organization - Models of a plasma membrane, Membrane permeability - Transport across cell membranes - Transmembrane signals - Artificial membranes - liposome, Eukaryotic Cell Cycle : mitosis and meiosis. Cellular Organelles – Cytoskeleton – components of Cytoskeleton, Microtubules, Intermediate filaments – Microfilaments, Endoplasmic reticulum, Golgi complex, Types of vesicles - transport and their functions, Lysosomes. Nucleus - Internal organization, Nuclear pore complex, Nucleosomes, Chromatin. Chloroplast structure and function – An overview of photosynthetic Metabolism – The absorption of light – Photosynthetic units and reaction centers – Photophosphorylation – Carbon dioxide fixation and the synthesis of carbohydrates. Chloroplast and its genome study. Mitochondrial Genome, Structure and Function – Oxidative Metabolism in the Mitochondrion – The Role of Mitochondria in the formation of ATP – Translocation of Protons and the Establishment of a proton-motive force – The Machinery for ATP formation – Peroxisomes. Genome studies of Mitochondria.

DNA and Protein Synthesis – Structure of DNA - evidence for DNA as genetic material. Genome Organization in prokaryotes and eukaryotes, DNA Replication, Repair & Recombination, Prokaryotic & Eukaryotic Transcription, Translation, Gene transfer in microorganisms – conjugation, transformation, transduction - protoplasmic fusion. The genomes of bacteria, viruses, plasmids. DNA Structural organization - DNA replication, Transcription – mRNA processing, Translation. Protein synthesis – Ribosomes, enzymes, Protein processing, Introduction to the methods of DNA sequencing – Gene Regulation

UNIT II-

Biochemistry: Classification and characteristics of monosaccharides, disaccharides – polysaccharides; epimers, isomers, anomers, chiral carbon atom, chair and boat form, glucopyranose and fructopyranose. Glycolysis - aerobic and anaerobic, regulation of glycolysis. Krebs cycle and its regulation; Hexose monophosphate shunt. Pathways of Carbohydrate Metabolism and Complex Carbohydrates, phosphoketolase pathway, glyoxylate and glucuronate pathways, Cori cycle. Interconversion of sugars, gluconeogenesis. Syntheses of disaccharides and polysaccharides, regulation of blood glucose and homeostasis. glycogenesis and glycogenolysis and their regulation, types and general functions, amino sugars, sialic acid and mucopolysaccharides. Structure and functions of glycoproteins and proteoglycans. Blood group sugar compounds, sugar nucleotides, bacterial cell wall components. Lectins - specificity, characteristics and uses, pectin, xylans. Definition and classification of lipids. Fatty acids - general formula, nomenclature and chemical properties Structure, function and properties of simple, complex, acylglycerols, phosphoglycerides, sphingolipids, waxes, terpenes, steroids and prostaglandins. Synthesis of fatty acid - structure and composition of fatty acid synthetase complex, pathway and regulation. synthesis of triacyl glycerides. Classification of enzymes, IUB system, enzyme substrate complex, active site of enzymes, stereo specificity and ES complex formation. Effect of temperature and pH and substrate concentration on reaction rate, activation energy, transition state theory, enzyme activity. Michaelis-Menten equation, significance of Vmax and Km, Enzyme inhibition, types of inhibitors and mode of action. Structure of nucleoside, nucleotide. De novo and salvage pathways of nucleotide synthesis. Experimental evidence for nucleic acids as genetic material. Secondary structure of DNA, Watson and Crick model of DNA. A, B and Z forms of DNA, Tm and its relation to GC content.

Bioinformatics fundamental: Introduction to Bioinformatics, Central dogma - information flow and Biological data types, Major Information Resources: NCBI, EBI, DDBJ, KEGG, Uniprot, ExPasy, Human Genome Project, Encode Project, 1000 Genome Project.

Major Databases in Bioinformatics: Databases overview, Primary & Secondary Databases. Database crosslinking, Integrated Search Engines- Entrez, SRS, DBGET etc.

Literature Databases: PubMed and Medline. Concept of Open-source and Proprietary tools in Bioinformatics.

Sequence Databases: Primary sequence databases of Nucleic acid and Proteins (Genbank, EMBL, DDBJ, Swiss-Prot, Uni-Prot, TrEMBL, PIR etc), Derived (Secondary) sequence databases (PROSITE, pFAM, PRINTS, ProDom, SMART, TIGRFAMs, InterPRO). Major Sequence file formats: FASTA, Genbank, EMBL, PIR, SWISSPROT. File format Conversion tools.

Structure Databases: Primary structure databases of Protein and Nucleic acid (PDB, MMDB, NDB), PDB file format. Secondary Structure Databases (SCOP and CATH), Molecular graphics representation and visualization tools (Jmol, Rasmol, Cn3D, Pymol, Chimera, VMD, DS Visualizer etc.)

Database Searching and Sequence Retrieval Methods: Database query type (Text, Sequence), Concepts of Sequence Similarity, Identity, and Homology; Sequence Similarity Searching Tools: BLAST, FASTA, PSI & PHI BLAST, Mega BLAST etc., Query Filtering and Limits, Algorithms of BLAST & FASTA and their statistical significance (E value and other parameters), Various flavors of BLAST & FASTA.

Specialized and Genome Databases:
Databases of Genomic Sequences: EST, STS and GSS.
Chemical Structure database (Pubchem, DrugBank, ZINC, ChEMBL).
Gene expression and Microarray Databases (Array Express, GEO, SAGE). Pathway Databases (LIGAND, Reactome and KEGG ENZYME). Gene Ontology(GO) database,
Protein-Interaction Databases (STRING, BioGRID, MINT, MIPS), Human (OMIM / OMIA), BioCyc,
Database of Genetic Variation: dbSNP, dbVar, dbGaP, ClinVar, MedGen.
Phylogenetic database – eggnog, HOGENOM, OrthoDB.
Genome Databases- NCBI-Genome, Ensembl Bacteria, Microbial Genome Database-MBGD, PlasmodiumDB, Model organisms specific - Yeast(SGD), Drosophila (FlyBase), C.elegans (WormBase), Rat, Mouse, Plants Specific – *Arabidopsis thaliana* (TAIR), Rice.
Genome Browsers: NCBI map viewer, Ensembl, UCSC, VEGA etc.

Data structure and algorithms: Fundamental Data Structures: Using Arrays, Singly Linked Lists, Circularly Linked Lists, Doubly Linked Lists, Asymptotic Analysis. Stacks, Queues, Dequeues: The Stack, Queue, Dequeue ADTs, Simple Array Based Stack, Queue, Dequeue Implementation, Implementing Stack, Queue with Singly Linked List, Reversing an Array using Stack, Matching Parenthesis and HTML tags, A Circular Queue. Trees: General Trees, Binary Trees, Implementing Trees, Tree Traversal Algorithms, Binary Search Trees, AVL Trees, B Trees. Sorting: Merge sort, Quick sort, Studying sorting through algorithmic lens, Comparing Sorting Algorithms. Heap: Priority Queues, Array Implementation of Heaps, Construction of Heaps, Heap Sort. Graphs: Data Structures for graphs, Graph Traversals, Transitive Closure, Directed Acyclic Graphs, Shortest Paths, Minimum Spanning Trees.

UNIT III-

Programming languages: – Algorithm – Flowchart – Programming language – Compiling and Linking – Testing and Debugging – Documentation – Maintenance - Utility program, C, C++ AND DATA STRUCTURES: Introduction to C language, Tokens – Keywords, Identifier, Variables, Constants, Operators – Expression – Data types – Operator precedence - Statements: Input statement, Output statement. Controls and loops – Conditional and Unconditional Control Statement – Looping Statements: while, do-while, for – Nested loops – Arrays. Procedural Concept – Structured Programming – Built-in library function – User defined functions – Pointer introduction – Passing a pointer to a function – Structure – Union – File handle: Read and Write

numerical and character data from/to a file. String Handling & Sorting – String declaration – String library functions - String Manipulation - Sorting: Bubble sort, Selection sort, Insertion sort – Searching: Linear search, Binary search. Object Oriented Programming: Programming in C++ – C++ programming – Object Oriented Concept: Encapsulation, Inheritance, Polymorphism – Different forms of Constructors – Destructors – Abstract class – Virtual function.

Genomics: Genomic Evolution & Organization: RNA world hypothesis, Genetics to Genomics, Forward and reverse genetics. Eukaryotic and prokaryotic genomes, Chromosome structure and function, Chromatin re-modeling/organization, DNA as genetic material, Central dogma of molecular biology. Genome Sequencing: Overview of conventional and new sequencing technologies, Strategies used in whole genome sequencing, NGS technologies, RNAseq, Genome annotation, Candidate gene discover and data mining, Transcription factor, Development of databases and their uses, Genome mapping by genetic and physical technique, Comparative genomics and SNP analysis. Techniques for Genomics: Restriction and modifying enzymes, Various blotting techniques, PCR techniques, RT-PCR, qPCR, Digital PCR, Site directed mutagenesis, Genomic and cDNA libraries, Screening of libraries, DNA microarray, Antisense RNA, RNA interference, TALEN, CRISPR-Cas9. Genome Initiatives: Structural and functional genomics, Advances in human genome, Advances in buffalo genome, Advances in arabidopsis genome, Advances in rice genome, Advances in wheat genome, Advances in tomato genome, Advances in sorghum genome, Advances in peanut genome etc. Genomics in gene function analysis, Genomics in plant and animal breeding and improvement, Genomics in drug discovery, Genomics in valued added crops, Genomics in recombinant protein etc.

Proteomics: Protein Basics, Proteomics basics, Forces that determine protein structure and physicochemical properties, Mechanisms of protein folding, Molten globule structure, Characterization of folding pathways. Protein isolation and profiling: Method for protein isolation and purification, Profiling by Native-PAGE, SDS-PAGE, 2-D/IEF SDS-PAGE, staining and de-staining, imaging and analysis of 1-D and 2-D gels. Protein characterization by Protein sequencing using various methods, Protein identification by mass spectrometry, Determination of post translation modification, Proteomics tools and databases, Thermal, enzymatic, physical, pressure, solvents, interactions effect on protein, Application of DSC, Protein denaturation, aggregation and gelation. Protein structure: Background and basic principles of various spectroscopic techniques used for protein structure determination, Absorption and fluorescence, Circular dichroism, FT-Raman, FT-IR, NMR, Protein crystallization and X-ray crystallography, MALLS. Development of novel protein, Basic concepts for design of a new protein, Site directed mutagenesis for specific protein function, Specific examples of novel engineered proteins.

Database management system: Database System Versus File Systems, Characteristics of Database, Database Concepts, Schemas & Instances, DBMS architecture and Data Independence, Data Models, Database Languages & Interfaces, View of Data, Database users and Administrators, Database System Structure, Database System Applications, Data models – ER Model: Keys, Constraints, Design Issues, Extended ER features, Reductions of ER Schema to Tables. Relational Model: Structure, Relational Algebra; Hierarchical Model, Network Model, Object Oriented Model, Structured Query Language – Basic Structure, Set Operations, Aggregate Functions, Null Values, Nested Sub queries, Views, Integrity: Domain constraints, Joined Relations, Data-Definition Language, Relational Database and Storage – Pitfalls in Relational Design Database. Functional

dependencies, Decomposition Normal Forms – 1NF, 2NF, 3NF & Boyce-Codd NF, Data Storage – Ordered indices, Hashing concepts - Security and Authorization. Concurrency control techniques & Information retrieval – Transactions: Properties of transactions: Concurrency problems, Serialisability and Locking techniques, Granularity of Data Items – Database System Architecture and Information retrieval: Centralized and Client-Server Architecture

UNIT IV-

Data structure and algorithms: Fundamental Data Structures: Using Arrays, Singly Linked Lists, Circularly Linked Lists, Doubly Linked Lists, Asymptotic Analysis. Stacks, Queues, Dequeues: The Stack, Queue, Dequeue ADTs, Simple Array Based Stack, Queue, Dequeue Implementation, Implementing Stack, Queue with Singly Linked List, Reversing an Array using Stack, Matching Parenthesis and HTML tags, A Circular Queue.
Trees: General Trees, Binary Trees, Implementing Trees, Tree Traversal Algorithms, Binary Search Trees, AVL Trees, B Trees.

Sorting: Merge sort, Quick sort, Studying sorting through algorithmic lens, Comparing Sorting Algorithms. Heap: Priority Queues, Array Implementation of Heaps, Construction of Heaps, Heap Sort. Graphs: Data Structures for graphs, Graph Traversals, Transitive Closure, Directed Acyclic Graphs, Shortest Paths, Minimum Spanning Trees.

Internet and web technology: Web 2.0: search, content networks, user-generated content, blogging, social networking, social media, tagging, social bookmarking, rich Internet applications, web services, location-based services, Web 2.0 monetization and business models, future of the Web. Extensible Hypertext Mark up Language (XHTML): XHTML syntax, headings, linking, images, special characters and horizontal rules, lists, tables, forms, internal linking, meta elements.Cascading Style Sheets (CSS): separation of content and presentation, inline styles, embedded style sheets, conflicting styles, Linking external style sheets, positioning elements, backgrounds, element dimensions, box model and text flow, media types, building a CSS drop-down menu, user style sheets. JavaScript: client side scripting, control statements, functions, arrays, objects, events. Document object model: objects and collections. Extensible Markup Language (XML) and RSS: Advantages and applications, structuring data, XML namespaces, Document Type Definitions (DTDs), XML vocabularies, RSS.

Biological sequence analysis & algorithms: Sequencing matching Algorithms, Exact matching, Edit distances, Hamming Distances, Dot Matrix, Suffix trees for LCS. Pairwise Sequence Alignments - Local and Global Alignment, Dynamic Programming using Needleman-Wunsch and Smith-waterman Algorithms, DNA and Protein Substitution matrices, Construction of PAM and BLOSUM Matrices, Position Specific Scoring Matrices (PSSM). Scoring methods of MSA (Sum of Pairs, Entropy based), Dynamic Programming for MSA, Progressive Alignment Methods (ClustalW/X etc.), Genetic Algorithm methods, Iterative Methods and Consensus Methods (M-COFFEE, MergeAlign). MSA constructs (Profiles, PSSM, Patterns, Motifs, Blocks and Fingerprints) and their applications. Sequence Logos. MSA Formats and MSA Editing tool. Introduction to Markov and Hidden Markov models, Viterbi Algorithm, Profile HMM, HMM for CpG Island. HMM Applications in Bioinformatics. HMMER tool. Structure of Genes, Open Reading Frames(ORF), Codon Bias, Pattern Recognition.

Gene Prediction Methods: Feature based, Homology based, Statistical and HMM based approaches.

Prediction of other Genomic Sites: Protein Binding Sites, Splice-site, Promoter & transfactor bind site, tRNA site prediction. Analysis of Genomic Repeats and tRNA site prediction. Comparative analysis of genomic sequences (Vista). Open Source packages - Unigene, Emboss, GrailEXP etc.

Analysis & Prediction of Physico-chemical properties of proteins - Amino acid composition, Molecular Weight, Isoelectric point, Hydrophobicity & Hydrophilicity. Searching for Conserved Pattern, Block, Motif, Domain in Sequence. Construction of sequence profile, fingerprint, and family signature using MSA. Protein Identification Tools using patterns, profiles, and fingerprints. Protein Analysis Servers (ExPasy, Predict Protein, SAPs etc). Analysis of Protein Spectra and Peptide Mass Fingerprint (PMF). Phylogenetics basics and numerical taxonomy, Phenetics and Cladistics Approaches, Phenogram, Cladogram and Dendrogram, Tree of Life, Tree structure and topology, Ultrametric Tree, Rooted and Unrooted Tree, Molecular clock hypothesis, Models of DNA sequence evolution, Tree reconstruction methods:- Distance based (UPGMA,NJ), character based methods (Maximum Parsimony) and statistical method (ML), Bootstrapping, Tools of Phylogenetics - ClustalW/X, Mega5, Phylip package etc.

UNIT V-

Computational structural biology: Structure of DNA and its different forms(A,B,Z), loops, turns and coils, Secondary Structure Elements (SSEs) and Super Secondary Structures, Motifs and Domains, structure of tRNA, Z-RNA, RNA hairpins and pseudoknots.

Structure Determination methods: Electromagnetic Spectrum, X- Ray Crystallography and NMR Spectroscopy. Secondary structure analysis using Ramachandran Plot, Contact-Maps analysis, Protein Binding Pockets & Tertiary Packing, Analysis of Protein Structure Surfaces (Conolly, Vdw, Solvent-accessible). Structural Alignment, Superposition and RMSD calculations, Structure alignment based databases (DALI, FSSP), HSSP database. Protein Structure Folds, Fold libraries, Structural Classification of Protein (SCOP, CATH). Protein Folding Problem, Representations of Molecular models,

Protein Secondary Structure Prediction - Chou-Fasman and GOR methods, JPred, PHD, PSI-PRED, PSI-PRED-Workbench –

Protein Tertiary Structure Prediction - Homology Modeling, Protein Threading or Fold recognition method, Ab-initio prediction methods, Side-chain Modeling, model evaluation and validation (Ramachandran plot analysis, Procheck, Whatcheck, ERRAT score, Prove, VERIFY3D, Saves and PROSA), Alpha fold, CASP Program.

RNA Structure Prediction methods - Minimum Free Energy and Machine learning based (RNAfold, mFold, CoFold, Sfold, CDPfold, SPOT-RNA). Protein-Ligand Interactions, Protein-Protein Interactions. Theory of Docking (Sampling Methods, Scoring Functions), Docking methodologies- Rigid ligand and rigid receptor docking, Flexible ligand and rigid receptor docking, Flexible ligand and flexible receptor docking. Monte Carlo sampling for

flexible receptor docking, Application of molecular docking for drug discovery. Docking Tools - MGLtools and Autodock, DOCK, Hex, Swiss-Dock, Haddock, Classical Dynamics, Molecular and Quantum mechanics. Force-fields and Potential Energy Functions of Biopolymer, Energy Minimization methods, Molecular Dynamics Ensembles (NE,NVE,NVT,NPT), Langevin Dynamics for controlling temperature & pressure, Biomolecular timescale and timestep limits. PDB File details, PSF File, Solvation, cutoffs, PME, rigid bonds, and multiple timesteps. Validation of Simulations (reverse coarse-graining and small-angle X-ray scattering) and Interpretations and Analysis of Results.

UNIT VI-

Data analytics using r: Basics Programming construct and Data Types:- Data Types: Numeric, Integer, Complex, Logical, Character

Vector: Combining Vectors, Vector, List, Arithmetic, Vector Index, Numeric Index Vector, Logical Index Vector, Named Vector Members, Array Matrix, Data Frame, Factors

Control Structures - IF-Else, For loop, While loop, Repeat, Next, Break; Functions,

Analysis using Descriptive and Pictorial Statistics: Mean, median, mode, harmonic mean, geometric mean, variance and standard deviation, quantiles, skewness, moments and kurtosis. Data Visualization: Summary table, Contingency table, Bar plot, Pie chart, Frequency distribution, Relative frequency distribution, Cumulative frequency distribution, Histogram, Frequency polygon, Cumulative frequency graphs, Box plot, Time series plot, Scatter diagram.

Data Relationships, Transformation, and Data Cleaning: Relationships between different types of data: Relationship between two categorical data, Relationship between categorical and quantitative data, Relationship between two quantitative data Transformation: The logarithm transformation, Root and square root transformation Standardization (Z-transformation), Min-max normalization. Data cleaning: missing values, noisy data.

Analysis using Inferential Statistics: Sampling, Sampling Distribution, and Estimation of Parameters, Sampling distribution of: means, proportions, difference of means, difference of proportions. Hypothesis testing about: population mean, the difference between two means, about a population proportion, difference between two proportions.

Packages & Bioinformatics Applications: Designing Packages, Popular Packages for Bioinformatics applications, Introduction to Bioconductor, R packages for Microarray/NGS Data analysis, Protein Structure visualization.

Bioinformatics databases: Bioinformatics data and databases, data models, data representation, mining, various types of databases, biological data and data analysis. Types of Biological data:- Genomic DNA, Complementary DNA, Recombinant DNA, Expressed sequence tags, Sequence-Tagged Sites, Genomic survey sequences;

Primary Databases:- GenBank, EMBL, DDBJ; Composite Databases:- NRDB, UniProt; Literature Databases:- Open access and open sources, PubMed, PLoS, Biomed Central, NAR databases; Bioinformatic Resources:- NCBI, EBI, ExPASy, RCSB.

Genome Databases – Viral genome database:-ICTVdb; Bacterial Genomes database:-Genomes OnLine Database –GOLD, Microbial Genome Database-MBGD;

Genome Browsers:- Ensembl, VEGA genome browser, NCBI-NCBI map viewer, KEGG, MIPS, UCSC Genome Browser; Archeal Genomics, Eukaryotic genomes with special reference to model organisms:-Yeast(SGD), Drosophila (FlyBase), C.elegans (WormBase), Rat, Mouse, Human (OMIM / OMIA), plants – Arabidopsis thaliana (TAIR), Rice, PlasmodiumDB, etc.

Sequence Databases – Nucleotide sequence Databases:- GenBank, EMBL, DDBJ; Protein sequences Databases:- Swiss-Prot, TrEMBL, UniProt, UniProtKB, UniParc, UniRef, UniMES;

Sequence motifs Databases:- Prosite, ProDom, Pfam, InterPro, Gene Ontology; Sequence file formats:- GenBank, FASTA, PIR, ALN/ClustalW2.

Structure and derived databases – Primary structure databases:- PDB, NDB, MMDB; Secondary structure databases:-Structural Classification of Proteins –SCOP, Class Architecture Topology Homology –CATH, Families of Structurally Similar Proteins –FSSP, Catalytic Site Atlas –CSA; Molecular functions /

Enzymatic catalysis databases:- KEGG ENZYME database; Protein-Protein interaction database:- STRING;

Chemical Structure database:- Pubchem; Gene Epression database:- GEO, SAGE.

Bioinformatics Database search engines – Text-based search engines (Entrez, DBGET / LinkDB).
Sequence similarity based search engines: BLAST and FASTA.

Motif-based search engines: ScanProsite and eMOTIF

Structure similarity based search engines: Combinatorial Extension, VAST and DALI

Proteomics tools:- ExPASy server, EMBOSS.

Database Design Concepts: Conceptual Modelling, Purpose of Database Systems, Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database languages, Database Architecture, Classification of DBMS, relational database, Database users and Administrators, Advantages of DBMS. Entities and Entity Sets, Relationships and Relationship Sets, Keys, Mapping, Constraints, ER Diagram, Reducing ER Diagram to tables, Generalization and Specialization, Aggregation.

Relational Model: Relational database Schemas, Relational Algebra, Relational Calculus (Tuple

Relational calculus and Domain Relational calculus), Update operations, Transactions, Dealing with constraint violations. Binary Relational operation: JOIN and DIVISION, SQL, More complex SQL Queries, Security & Integrity violations, authorization and views, integrity constants, encryption, Statistical databases.

Database Design Theory and Methodology: Pitfalls in relational database design, Functional Dependencies, Decomposition Using Functional Dependencies. Normalization using functional Dependencies, General Definition of First, Second, Third and Fourth Normal Form. Boyce-Codd Normal Form(BCNF), Multivalued and join dependencies, DKNF.

Transaction Processing Concepts and Concurrency Control Techniques: Transaction Processing, Desirable Properties of Transactions, Transaction State, Characterizing Schedules based on Recoverability and Serializability. Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity, Deadlock Handling, Recovery and Atomicity, Log-Based Recovery.

Distributed Databases and Client-Server Architectures: Types of Distributed databases, data fragmentation, Replication and Allocation Techniques for Distributed Database Design, Query Processing in Distributed Databases, Overview of Concurrency Control and Recovery in Distributed Databases, An Overview of 3-Tier Client-Server Architecture.

Systems biology & biological networks: System-level-Understanding of Biological Systems, Measurement Technologies and experimental methods, Comprehensive Measurements, Measurement for Systems Biology, Next-generation Experimental Systems. System structure identification, Bottom-up-approach, Top-down-approach, epigenetics, The biochemistry of DNA Methylation and the role of Transcription Factors, identification of disease genes, role of bioinformatics, reference genome sequence, integrated genomic maps, gene expression profiling; identification of SNPs, SNP database (DbSNP). Role of SNP in Pharmacogenomics, SNP arrays.

Modeling Genetic Networks- Modeling the activity of a single gene, Gene Regulatory Network(GRN), gene regulation, Computational approaches for the reconstruction of gene regulatory networks with DNA pattern scanning (Information Theory, Position weight matrices), gene expression compendia (CLR and similar), and integration of ChIP-Seq data.

Metabolomics, Metabolites; Fingerprinting and footprinting of metabolites; Profiling of metabolites; Targeted analysis of metabolite, Microbial metabolomics; Plant metabolomics; Human metabolomics, Data analysis.

Epigenomics: Epigenomics using ChiP-Seq Method (Transcription Factors, histone modifications and chromatin states, DAP-Seq). Case studies examples (ChIP-Seq analysis with identification of transcription factor binding sites, CLR on a gene expression compendium of E. coli).

UNIT VII-

Biosignal Acquisition System: Man-machine instrumentation system: Category and factors in measurement, biometrics, problems encountered in measuring a living system, Electrical safety considerations. Signals and noise: Types of bio-signal and its sources, Electrodes for bio-physiological sensing, Transducers and other sensors, Recording problems and its remedy. Bioelectric amplifiers and filters: Different types of amplifiers and their principles of operation, Types of filters and their applications. Recording and digitization of signals: Types of recorder, analog and digital filters, Concept of analog to digital conversion. Biotelemetry: Electrophysiological telemetry, Radio telemetry system, Portable telemetry system, Land-line telemetry system.

Drug designing, Pharmaceutical Biotechnology, Antibacterial antibiotics; narrow spectrum and broad spectrum antibiotics, mode of action of antibiotic, antifungal antibiotics, antiviral agents, antitumor agents, Chemical disinfectants, antiseptics, preservatives, Sulfa drugs, synthetic vaccines, DNA vaccines, edible vaccines, Policies in drug designing, Quality assurance, ISO, WHO, certification, Good manufacturing practices, GMP, GLP, Government regulations, policies, Food and drug administration, Natural product, drug Development, Bioinformatics in drug development, Chemoinformatics and Pharmacoinformatics, In-Silico Drug Designing, Area influencing drug discovery; Molecular Biology, pharmacogenomics and pharmacoproteomics, Structure-based drug designing, Target Identification and Validation, homology modeling and protein folding, receptor mapping, active site analysis and pharmacophore mapping, Grid maps, Ligand-based drug designing and docking, Ligand-based drug designing approaches, Lead Designing, combinatorial chemistry, High Throughput Screening (HTS), QSAR, Database generation and Chemical libraries, ADME property, docking methods to generate new structure; Tools and Molecular docking programs: AutoDock, Dock, HEX.

Cheminformatics and Drug Design: Molecular Visualization, Representation and Manipulation of 2-D Molecular Structures: SMILES, Computer representation of Chemical Structures (2D, 3D), Structure Searching, Substructure searching. Molecular Designing, Chemical Structure Building and Structure optimization. 2D to 3D structure conversion, Structure Charging and Electrostatics Analysis, File formats in CADD - pdb, pdbqt, mol2, sdf, dlg etc. Open Source/ Free Tools for Sketching. Introduction to Drug, Physicochemical properties (LogP, LogD, and Topological Polar Surface Area), Lipinski's rule of Five, QSAR (2D, 3D) and its applications (QSAR for predicting biological property, QSAR for Virtual Screening), Chemistry of drug- metabolism, drug deactivation and elimination. Drug-receptor interactions, receptor theories and drug action; Theories of enzyme inhibition and inactivation; Enzyme activation of drugs and prodrugs. Chemistry of ADME and toxicity properties of drugs. CADD Databases- PDB, PubChem, UniProt, KEGG, Zinc, DrugBank, Chembl, MMsINC, STITCH, STRING, GENECARD, MALACARDS, SuperTarget, Therapeutic target DB, Disgenet, BindingDB, DataWarrier. Tools of Drug Discovery- Prediction of Physico-chemical properties (VCCLAB,ChEMBL, Chemaxon), Prediction of ADME/T properties (admetSAR, ADMETlab etc). Drug dose Response and Therapeutic index, Lipophilicity, Toxicity Analysis and Prediction.

Drug Discovery Process and CADD- Introduction to drug and drug discovery pipeline, Overview of conventional and rational drug design, High-throughput screening (HTS) in Drug Discovery.

In-Silico Drug designing approaches: Structure based (Rational), Ligand based, Pharmacophore based methods. Pre-Clinical and Clinical Trials. Bioethics and Drug Regulatory Procedures. Drug

Repurposing, Scaffold Hopping MultiTarget Analysis (secSAR). Drug Targets, Lead Identification & Optimization- Druggable Genome and Known Drug Targets, Pathway Analysis. Target Identification and characterization, Validation of Target against known drugs for other diseases, Binding Pockets and Surface Analysis, Pharmacophore and Molecular Descriptor Analysis. Combinatorial Library Designing. Random Screening, Generation of hits/leads by structure-based virtual screening against target. QSAR-based VS in drug discovery. High-throughput Virtual Screening. Docking and Simulation Analysis for Drug-Receptor interactions (Autodock, Gromacs). Lead Optimization.

UNIT VIII-

NGS Data Analysis: Different NGS Platforms – Illumina, Ion Torrent Semiconductor Sequencing, Pacific Biosciences SMRT, ONT Nanopore; Major Applications of NGS.

Base Calling, Quality Control & Read Mapping: FASTQ File Format, Base Quality Score, NGS Data Quality Control and Preprocessing; Reads Mapping – Mapping Approaches and Algorithms, Selection of Mapping Algorithms and Reference Genome Sequences, SAM/BAM as the Standard Mapping File Format, Mapping File Examination and Operation, Tertiary Analysis, NGS Data Storage, Transfer, and Sharing, Computing Power Required for NGS Data Analysis, Bioinformatics Skills & Software Required for NGS Data Analysis.

Transcriptomics by RNA-Seq: Experimental Design: Factorial Design, Replication and Randomization, Sample Preparation, Sequencing Strategy; RNA-Seq Data Analysis: Data Quality Control and Reads Mapping, RNA-Seq Data Normalization, Identification of Differentially Expressed Genes, Differential Splicing Analysis, Visualization of RNA-Seq Data, Functional Analysis of Identified Genes; RNA-Seq as a Discovery Tool. Small RNA Sequencing: Data Generation, Preprocessing, Mapping, Identification of Known and Putative Small RNA Species, Normalization, Identification of Differentially Expressed Small RNAs, Functional Analysis of Identified Small RNAs.

Genotyping and Genomic Variation Discovery: Data Preprocessing, Mapping, Realignment, and Recalibration; Single Nucleotide Variant (SNV) and Indel Calling: SNV Calling, Identification of de novo Mutations, Indel Calling, Variant Calling from RNA-Seq Data, Variant Call Format (VCF) File, Evaluating VCF Results. Structural Variant (SV) Calling: Read-Pair-Based SV Calling, Breakpoint Determination, De novo Assembly-Based SV Detection, CNV Detection, Integrated SV Analysis; Annotation of Called Variants, Testing of Variant Association with Diseases or Traits.

De novo Genome Assembly & ChIP-Seq Analysis: Genomic Factors and Sequencing Strategies for de novo Assembly, Genomic Factors That Affect de novo Assembly, Sequencing Strategies for de novo Assembly; Assembly of Contigs, Sequence Data Preprocessing, Error Correction, and Assessment of Genome Characteristics, Contig Assembly Algorithms; Scaffolding, Assembly Quality Evaluation, Gap Closure, Limitations and Future Development. Principle of ChIP-Seq, Experimental Design: Experimental Control, Sequencing Depth, Replication; Read Mapping, Peak Calling, and Peak Visualization, Differential Binding Analysis, Functional Analysis, Motif Analysis, Integrated ChIP Seq Data Analysis.

Machine learning: Linear Algebra and Statistics (matrices and vectors, Eigen value decomposition, principal component analysis), target function representations.

Supervised Learning, Basics of Feature Selection and Evaluation, Decision Tree, Overfitting and Pruning, Logistic regression, Support Vector Machine and Kernel; Noise, bias-variance trade-off, under-fitting and over-fitting concepts.

Neural Networks: Perceptrons, representational limitation and gradient descent training. Multilayer networks and back propagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.

Unsupervised and Semi Supervised Learning, Learning from unclassified data. Clustering. Hierarchical Agglomerative Clustering. K-means partitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labeled and unlabled data.

Medical Genomics: Eukaryotic gene structure, Regulatory architecture of the human genome, Mitochondrial genome, DNA amplification (PCR), DNA libraries, NGS, DNA variation, Important advances that contributed to the development of genetics and genomics. Mendalian traits, Genetic recombination, Genetic linkage and association analysis, Quantitative difference in genetic traits, Hardy-Weinberg Equilibrium, inbreeding, Regulation of Gene function, Targeted gene disruption, Non coding RNAs, Epigenetic modifications, DNA methylation, Changes in chromatin structure, Genomic imprinting, Signalling pathways. Genetic diagnosis, Genome analysis with microarrays, GWAS, Array CGH, Genetics in medicine, Genetic classification of diseases, OMIM, Homeostasis and its imbalance, Metabolic disorders, Immune system disorders, Impaired Cell and tissue structure, disregulated signalling pathways. Genomic disorders, Telomere defects, cancer prognosis and diagnosis, Haemoglobin disorders, Mitochondrial diseases, Chromosomal translocations, Chromosomal aberrations, ACMG guidelines, Pharmacogenetics, Pharmacogenomics, gene and stem cell therapy, Ethical and societal issues, patient education and counselling. Human Microbiome, Microbiome in health and disease, Methods of microbiome analysis, 16s rDNA metagenomics, Shotgun metagenomics, Functional analysis of metagenomic data, Network analysis of metagenomic data, modulation of human microbiome, Microbiome as drug candidate.

UNIT IX-

Biocomputing with perl: Availability, Support, Versions, Installation. Significance of Perl in Bioinformatics, Scalar Data, Numbers, Strings, Scalar Operators, Scalar Variables, Scalar Operators and Functions. Arrays and List Data: Literal Representation, Variables, Array Operators and Functions, Scalar and List Context. Hashes: Hash Variables, Literal Representation of a Hash, Hash Functions, Hash Slices. Control Statement blocks, Loops and Conditions. Basic Input/Output. Advance Constructs and Features, Regular Expressions, Simple Usage of Regular Expressions, Patterns, Matching Operators, Substitutions, Split and Join functions, Subroutines: System and User Functions, Local Operator, Length, Parameter Lists, Lexical Variables, File Handles and File Tests: Opening and Closing a File handle. Object-Oriented Perl and Perl-CGI, Modules, Creating Objects and References. Anonymous Data types, CGI Programming: The CGI.pm Module, CGI Program in Context, Simple CGI Programs, Passing Parameters via CGI,

Perl and the Web. Perl Programming Constructs for Bioinformatics, Representing String and Sequenced Data in Perl, Manipulation of Biological Sequences, Concatenating DNA Fragments, DNA to RNA Transcription, Translation, Reading Genes & Proteins from File, Finding Motifs, Counting Nucleotides and Composition Analysis. Reading FASTA files. Finding Open Reading Frame, Generating random DNA, RNA & Protein sequences. Parsing Genbank and PDB Files, Parsing BLAST Output.

BioPerl, Installation Procedures, fundamental constructs and special features; BioPerl Modules, Creating BioPerl Objects.

Immuno-Informatics, Vaccine Design, Databases & Tools: Immunity and Immune response, Antigens and Antibody Structure, B-Cell and T-Cell Epitopes, MHC, Immune-Receptors, Vaccines, Types of Vaccines, Concepts of Vaccine Design and Reverse vaccinology, specialized Databases for Vaccine Design - Signal 1.4 database - Single Peptide Cleavage site; IEBD database - Epitope prediction:MHC-I, MHC-II, B-Cell,T-cell); Pep-Fold database - Peptide and mini-protein structure prediction. Prediction of immunogenic regions in antigenic protein

Analysis of Epitopes and Antigenicity Prediction:
Functional Analysis of Antigenic Proteins - physico-chemical characteristics, antigenicity, allergic nature; CTL Prediction (NETCTL1.2), B-Cell/T-cell Prediction (BCP/FBC/AAP Method), Antigenicity Epitope Prediction(VAXIJEN), Allergenicity & Antigenicity Prediction(ALG-PRED).

Bioinformatics Based Vaccine Design and Structure Analysis of Vaccine Lead:
Biochemistry of disease, identification of antigenic targets for vaccine (KEGG-Pathway analysis), Prediction and analysis of Antigenic Target Protein for Epitopes, Antigenicity & Antiallergicity, Screening of Minimal Epitope Set, Screening of Epitopes assembled and Prediction Population Coverage (PPC) analysis, Use of Adjuvants and Linkers for Epitope binding and formation of vaccine lead. Antigen-Antibody Modelling (Automated and Alignment based) and Docking, Secondary and Tertiary structure prediction of Lead (PSI-PRED), Ramachandran Plot Analysis, Molecular Docking of Vaccine lead with Immune Receptors, Molecular Dynamics Simulation of Target-Receptor complex. Interpretation of Results. Experimental Validation - Preclinical and Clinical Testing.

Soft computing: Introduction to Artificial Intelligence System, Neural Network, Fuzzy Logic & Genetic Algorithm. Fuzzy Set Theory: Fuzzy Versus Crisp, Crisp Set, Fuzzy Set, Crip Relation, Fuzzy Relations.

Fuzzy System: Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based System, Defuzzification Methods, and Applications.

Genetic Algorithms, Basic Concepts, Creation Of Offspring, Working Principle, Encoding, Fitness Function, Reproduction. Genetic Modeling, Inheritance Operations, Cross Over, Inversion And Deletion, Mutation Operator, Bit Wise Operators, Generation Cycle, Convergence Of Genetic Algorithm, Application, Multi-Level Optimization, Real Life Problems, Difference And Similarities Between GA And Other Traditional Methods,

Advanced In GA.

Neural Networks, Human Brain, Model Of An Artificial Neuron, Neural Network Architectures, Characteristic Of Neural Networks, Learning Method, Taxonomy Of Neural Network Architectures, History Of Neural Network Research, Early Neural Network Architectures, Some Application Domains.

Back Propagation, Network Architecture Of Back Propagation Network, Back Propagation Learning, Illustration, Applications, Effect Of Tuning Parameters Of The Back Propagation Neural Network, Selection Of Various Parameters In BPN, Variations Of Standard Back Propagation Algorithm. Associative Memory And Adaptive Resonance Theory, Autocorrelations, Hetrocorrelators , Multiple Training Encoding Strategy, Exponential BAM, Associative Memory For Real Coded Pattern Pairs, Applications, Introduction To Adaptive Resonance Theory, ARTI, Character Recognition Using ARII

Intellectual Property: Patents, Trademarks, Copyright, Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications, Protection of GMOs, IPs of relevance to Biotechnology and Case Studies; Agreements and Treaties, Indian Patent Act 1970 & recent amendments, Types of patent applications, Ordinary, PCT, Conventional, Divisional and Patent of Addition; Specifications: Provisional and complete; Forms and fees, Invention in context of "prior art".

Patent Filing Procedures: National & PCT filing procedure; Time frame and cost; Status of the patent applications filed; Precautions while patenting–disclosure/non-disclosure; Patent licensing and agreement Patent infringement.

Biosafety: Biosafety Levels of Specific Microorganisms; Biosafety guidelines, Definition of GMOs & LMOs; Roles of Institutional Biosafety Committee, applications in food and agriculture; Environmental release of GMOs; Risk Analysis, Risk management and communication; National Regulations and relevant International Agreements, Cartagena Protocol.

Bioethics: Ethical implications of biotechnological products and techniques, Social and ethical implications of biological weapons.

Other forms of IPR protection – Copyright - Trademark - Designs - Importance in Indian Scenario & laws in India for IPR protection.

Analytical techniques in biotechnology: Centrifugation Techniques and Imaging, steady state sedimentation, density gradient centrifugation, ultracentrifugation, Atomic Force Microscopy, Scanning & Transmission Electron Microscopy, Electro-kinetics, Electro-osmosis and electrophoresis, Helmholtz-Smoluchowski equation, Zeta potential, Gel electrophoresis; SDS PAGE, gradient gels, Two dimensional gels, isoelectric focusing, Chromatographic Techniques, column chromatography, partition and adsorption chromatography, Affinity Chromatography; Ion Exchange Chromatography, Gas Chromatography, HPLC, Spectroscopy, Beers Lamberts law, Visible and UV Spectrophotometry; Spectroflourimetry (FRET); FTIR, NMR spectroscopy, flame emission / atomic absorption spectrophotometry and their comparative study, Mass spectrometry,

Differential scanning calorimetry and Thermogravimetry

UNIT X-

Programming language C: Characteristics of C, Program Structure, Constants, Data types, Variables, Keywords, Console Input/output Statements, Compilation and Execution, Operators, Branching & Looping Statements, Arithmetic Unary Assignment Relational & Logical Conditional, If Statement, Nested if ,Statement else-if. Ladder switch, Statement Looping. Concepts for loop while loop do-while loop Jump Statements. Arrays & Functions, Single & Multi Dimensional Arrays, Types of Functions, Functions and Arrays Function. Prototyping, Scope of Variables Built-in Functions, Strings, Pointers & Structures, String Manipulation, Static Initialization, Pointers and Structures, Illegal indirection. New Data types, Unions Type Casting Enumerated, Data types Static Variables, Type Definition.

Visual Basic and .NET Programming: Event driven programming, History of VB.Net, Features of VB.Net, Architecture of VB.Net [.Net server, framework, services etc.]. 1.2 Net Framework: framework components, classes, CLR, VB.Net IDE, VB.Net: Variables, Keywords, constants, Data types, Conditional statements, looping statements, case control statements.

.NET controls: Activex controls, Forms, Controls & properties Text Boxes, Labels, Command Button, Radio Button, Option Buttons, Check Boxes, List Box ,ComboBox,Scoroll Bar, Progress Bar, Group Box,. Calendar, Date Time Picker, Picture Box, Image List, Rich Text Box, Popup/Content Menus, List View Control , Tree View Box. The array class collections, lists, string class, jagged array, array list, OOP using .net Classes Objects, constructor, destructor Methods, properties, delegates, assemblies, namespaces.

ADO.Net: Components of ADO.Net, Features of ADO.Net, Datasets, Data table, Datarow, datacolumn, Datareader, ADO.Net programming.

Nprogramming i java: Java Basics, Exception Handling, I/O & JDBC –, Multithreading and Communication, AWT & Event Handling, BioJava

Animal cell culture and technology: Basic techniques of mammalian cell culture in vitro, balance salt solutions and simple growth medium, Maintenance of animal cell culture, Serum and protein fee defined media and their application, Measurement of cell death, apoptosis mechanism and significance, Cell transformation, transfection, Stem cells, Cell culture based vaccines, three dimensional culture and tissue engineering

Microscopic techniques for image processing: Transmission electron microscopy, Scanning electron microscopy, Specimen preparation for EM, Ultramicrotomy, Image processing and image analysis by computer, Atomic Force microscopy and Confocal Microscopy

Physics for biologists: Classical Mechanics – concepts of Motion, Newton's Laws of Motion, Work and energy, Linear momentum and collisions, Rigid body rotation, Angular Momentum, Quantum Mechanics, Thermodynamics , Fundamental Ideas of Thermodynamics, Heat Capacity, Enthalpy, Heat engines, Free Energy, Electricity, electrostatic Field, The electric potential,

Electromagnetic waves, Fresnel diffraction, Fraunhofer diffraction, Diffraction patterns.

Biological spectroscopy: UV- Visible spectroscopy, Infrared spectroscopy , Raman spectroscopy, Magnetic Resonance Spectroscopy – Nuclear Magnetic Resonance Spectroscopy, Electron Spin Resonance Spectroscopy, X-ray Spectroscopy

Plant systems biology: Introduction to Plant System Biology, Molecular Basis of Growth and development, Molecular mechanism in plant adaptation, Discipline and tools in plants system biology, Visualization Tools for plant system biology: Genevestigator, Mapman, Cytoscape, VirtualPlant, CAD, precise genome editing- ZFN, TALEN, CRISPR, Synthetic biology application in plants

SYLLABUS

for written Examination to be conducted for the post of Assistant Professor in the stream of Information Technology

UNIT I: Number System and Discrete Mathematics

Data representation, complements, computer arithmetic-Add, Sub., Mul., and Div. Data types, error detection codes, Fixed point representation, floating point representation, number system and conversion.

Equivalent relations partial ordering representation and properties of relation set operation counting mathematical induction and discrete.

Probability basics of counting, baye's theorem, Inclusion-Exclusion principle, Mathematical induction, Permutations and Combinations, pigeon hole principle.

Group Theory: Groups, Subgroups, Semi Groups, Product and Quotients of Algebraic Structures, Isomorphism, Homomorphism, Automorphism, Rings, Integral Domains, Fields, Applications of Group Theory.

Graph theory: Simple Graph, Multigraph, Weighted Graph, Paths and Circuits, Shortest Paths in Weighted Graphs, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits, Planner graph, Graph Coloring, Bipartite Graphs, Trees and Rooted Trees, Prefix Codes, Tree Traversals, Spanning Trees and Cut-Sets.

UNIT II: Operating system and Simulation concepts

Basics of Operating Systems: Operating System Structure, Operations and Services; System Calls, Operating-System Design and Implementation; System Boot.

Process Management: Process Scheduling and Operations; Interprocess Communication, Communication in Client–Server Systems, Process Synchronization, Critical-Section Problem, Peterson's Solution, Semaphores, Synchronization.

CPU Scheduling: Scheduling Criteria and Algorithms; Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling.

Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance and Detection; Recovery from Deadlock.

Memory Management: Contiguous Memory Allocation, Swapping, Paging, Segmentation, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files.

Introduction to Simulation: Introduction to Simulation, advantages and disadvantages of simulation, application, software design, systems and systems environment, components of a system, discrete and continuous systems

Model of a system, types of models, discrete-event simulation, steps in a simulation study, Simulation of Queueing systems.

Generation of Pseudo-Random Numbers: Techniques for Generation of Pseudo-Random Numbers: Linear Congruential, Combined Linear Congruential, Random Number streams, Tests for Random Numbers.

UNIT III: Data structures and Design, Analysis of Algorithms

Data Structures: Arrays and their Applications; Sparse Matrix, Stacks, Queues, Priority Queues, Linked Lists.

Trees: Forest, Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree, B Tree, B+ Tree, B* Tree, Data Structure for Sets, Graphs, Sorting and Searching Algorithms; Hashing.

Time and Space Complexities; Asymptotic Notation, Recurrence Relations.

Design Techniques: Divide and Conquer; Dynamic Programming, Greedy Algorithms, Backtracking, Branch and Bound.

Lower Bound Theory: Comparison Trees, Lower Bounds through Reductions.

Graph Algorithms: Breadth-First Search, Depth-First Search, Shortest Paths, Maximum Flow, Minimum Spanning Trees.

Complexity Theory: P and NP Class Problems; NP-completeness and Reducibility.

UNIT IV: Database Management System and Warehouse

Database need and evolution, Characteristics of a Database approach, Data Models, Schemas, and Instances, Three-Schema Architecture and Data independence, Database Language and Interfaces, Centralized and Client/Server Architecture for DBMS

Entity-Relationship Diagram, Relational Model- Constraints, Languages, Design and Programming, Relational Database Schemas, Update Operations and Dealing with Constraint Violations, Relational Algebra and Relational Calculus, Codd Rules.

Data Definition and Data Types, Constraints, Queries, Insert, Delete, and Update Statements, Views, Stored Procedures and Functions, Database Triggers.

Functional Dependencies and Normalization, Algorithms for Query Processing and Optimization, Transaction Processing, Concurrency Control Techniques.

Data warehouse Definition, goals and need of Data Warehouse, Evolution of data warehouse. Principles of Data Warehousing (Architecture and Design Techniques): Three-tier Architecture for a warehouse, Data Warehouse Models

Data Pre-processing, ETL and Data Cleaning, Missing values, Noisy data, Data cleaning as process, Decision Trees, Clustering, OLAP V/S OLTP Technologies, operations of OLAP, Data model for OLTP and OLAP.

UNIT V: Software Engineering

Software Process, Generic Process Model – Framework Activity, Task Set and Process Patterns; Process Lifecycle, Prescriptive Process Models, Project Management, Component Based Development, Aspect-Oriented Software Development, Formal Methods, Agile Process Models – Extreme Programming

(XP), Adptive Software Development, Scrum, Dynamic System Development Model, Feature Driven Development, Crystal, Web Engineering.

Functional and Non-Functional Requirements; Eliciting Requirements, Developing Use Cases, Requirement Analysis and Modelling; Requirements Review, Software Requirment and Specification (SRS) Document.

Software Design: Abstraction, Architecture, Patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Cohesion and Coupling; Object-Oriented Design.

Software Quality: McCall's Quality Factors, ISO 9126 Quality Factors, Quality Control, Quality Assurance, Risk Management, Risk Mitigation, Monitoring and Management (RMMM); Software Reliability.

Estimation and Scheduling of Software Projects: Software Sizing, LOC and FP based Estimations; Estimating Cost and Effort; Estimation Models, Constructive Cost Model (COCOMO), Project Scheduling and Staffing; Time-line Charts.

Software Testing: Verification and Validation; Error, Fault, Bug and Failure; Unit and Integration Tesing; White-box and Black-box Testing; Basis Path Testing, Control Structure Testing, Deriving Test Cases, Alpha and Beta Testing; Regression Testing, Performance Testing, Stress Testing.

Software Configuration Management: Change Control and Version Control; Software Reuse, Software Re-engineering, Reverse Engineering.

UNIT VI: Networks and Security

Computer Networks: Network Topologies, Local Area Networks, Metropolitan Area Networks, Wide Area Network, Wireless Networks, Internet.

Network Models: Layered Architecture, OSI Reference Model and its Protocols; TCP/IP Protocol Suite, Physical, Logical, Port and Specific Addresses; Switching Techniques.

Functions of OSI and TCP/IP Layers: Framing, Error Detection and Correction; Flow and Error Control; Sliding Window Protocol, HDLC, Multiple Access – CSMA/CD, CSMA/CA, Reservation, Polling, Token Passing, FDMA, CDMA, TDMA, Network Devices, Backbone Networks, Virtual LANs.

IPv4 Structure and Address Space; Classful and Classless Addressing; Datagram, Fragmentation and Checksum; IPv6 Packet Format, Mapping Logical to Physical Address (ARP), Direct and Indirect Network Layer Delivery; Routing Algorithms, TCP, UDP and SCTP Protocols; Flow Control, Error Control and Congestion Control in TCP and SCTP.

Network Security: Malwares, Cryptography and Steganography; Secret-Key Algorithms, Public-Key Algorithms, Digital Signature, Virtual Private Networks, Firewalls.

UNIT VII: Data communication and Client Server Architecture

Data Communication: Components of a Data Communication System, Simplex, Half-Duplex and Duplex Modes of Communication; Analog and Digital Signals; Noiseless and Noisy Channels; Bandwidth, Throughput and Latency; Digital and Analog Transmission; Data Encoding and Modulation Techniques; Broadband and Baseband Transmission; Multiplexing, Transmission Media, Transmission Errors, Error Handling Mechanisms.

World Wide Web (WWW): Uniform Resource Locator (URL), Domain Name Service (DNS), Resolution - Mapping Names to Addresses and Addresses to Names; Electronic Mail Architecture, SMTP, POP and IMAP; TELNET and FTP.

Client Server Architecture: Client Server Architecture, Two-Tier Architecture, Three-Tier Architecture, N-Tier Architecture, N-Tier vs 2-Tier Architecture. types of Servers, File Server, Database Server, Communication Server, Object Server, Groupware Server, Transaction Server, Characteristics and types of Clients, Thin Client, Fat Client. Client Server System Architecture, Client Server Building Blocks, Hardware, Client Hardware, Server Hardware, Client Server Building Blocks, Software, Client Server Systems Development Methodology

Project Management, Architecture Definition, Systems Development Environment, Middleware, Types of Middleware, DCE, MOM, TP, Monitors, ODBC, Design Overview of ODBC, ODBC Architecture, Components, Applications, Driver Managers, Database Drivers, ODBC Data Sources, Network Operating System, Base Services, External Services.

UNIT VIII: Programming Paradigms and Languages

Programming Language Concepts, Paradigms and Models, Programming Environments, Virtual Computers and Binding Times, Programming Language Syntax, Stages in Translation, Formal Transition Models.

Elementary Data Types: Properties of Types and Objects; Scalar and Composite Data Types.

Procedural Programming: Tokens, Identifiers, Data Types, Sequence Control, Subprogram Control, Arrays, Structures, Union, String, Pointers, Functions, File Handling, Command Line Arguments, Pre-processors.

Object Oriented Programming: Class, Object, Instantiation, Inheritance, Encapsulation, Abstract Class, Polymorphism. Tokens, Identifiers, Variables and Constants; Data types, Operators, Control statements, Functions Parameter Passing, Virtual Functions, Class and Objects; Constructors and Destructors; Overloading, Inheritance, Templates, Exception and Event Handling; Streams and Files; Multifile Programs.

UNIT IX: Theory of Computation and Compiler Design

Regular Language Models: Deterministic Finite Automaton (DFA), Non-Deterministic Finite Automaton (NDFA), Equivalence of DFA and NDFA, Regular Languages, Regular Grammars, Regular Expressions, Properties of Regular Language, Pumping Lemma, Non-Regular Languages, Lexical Analysis.

Context Free Language: Pushdown Automaton (PDA), Non-Deterministic Pushdown Automaton (NPDA), Context Free Grammar, Chomsky Normal Form, Greibach Normal Form, Ambiguity, Parse Tree Representation of Derivation Trees, Equivalence of PDA's and Context Free Grammars; Properties of Context Free Language.

Turing Machines: Standard Turing Machine and its Variations; Universal Turing Machines, Models of Computation and Church-Turing Thesis; Recursive and Recursively-Enumerable Languages; Context-Sensitive Languages, Unrestricted Grammars, Chomsky Hierarchy of Languages

Compilers: Syntax Analysis: Associativity, Precedence, Grammar Transformations, Top Down Parsing, Recursive Descent Predictive Parsing, LL(1) Parsing, Bottom up Parsing, LR Parser, LALR(1) Parser.

Semantic Analysis: Attribute Grammar, Syntax Directed Definitions, Inherited and Synthesized Attributes; Dependency Graph, Evaluation Order, S-attributed and L-attributed Definitions; Type-Checking.

Run Time System: Storage Organization, Activation Tree, Activation Record, Stack Allocation of Activation Records, Parameter Passing Mechanisms, Symbol Table.

Intermediate Code Generation: Intermediate Representations, Translation of Declarations, Assignments, Control Flow, Boolean Expressions and Procedure Calls.

Code Generation and Code Optimization: Control-flow, Data-flow Analysis, Local Optimization, Global Optimization, Loop Optimization, Peep-Hole Optimization, Instruction Scheduling.

UNIT X: Artificial Intelligence and Business Intelligence

Definition, AI approach for solving problems, Turing Test and Rational Agent Approaches, State Space Representation of Problems, Logic, Semantic Networks, Frames, Rules, Scripts, Conceptual Dependency and Ontologies, Expert Systems, Handling Uncertainty in Knowledge, Components of a Planning System, Linear and Non-Linear Planning, Goal Stack Planning, Hierarchical Planning, STRIPS, Partial Order Planning.

Heuristic Search Techniques, Game Playing, Min-Max Search, Alpha Beta Cutoff Procedures

Agents and Objects, Agents and Expert Systems, Generic Structure of Multiagent System, Semantic Web, Agent Communication, Knowledge Sharing using Ontologies.

Business Intelligence, Decision Support Systems, Applications of BI, Types of Digital Data - structured, semi structured and unstructured data, Terminologies-Data, Knowledge Information, Intelligence.

BI Technology, BI Roles & Responsibilities, Best practices in BI, Framework of BI, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI from text and the Web: Text and Web mining, enterprise content management.

Measures, Metrics, KPIs and Performance Management, Reporting Tools- Scorecards, Dashboards.

MATHEMATICS

SYLLABUS

1. Real Analysis

Elementary Set Theory, Countable and uncountable sets, real number system as a complete ordered field, Archimedean property, supremum and infimum, sequences and series, convergence and absolute convergence. Various types of convergences, limit superior and limit inferior. Bolzano-Weierstrass theorem, Heine-Borel theorem. Continuity and uniform continuity, differentiability, sequences and series of functions and their convergence viz. Cauchy's Criteria and Weierstrass M-test for convergences. Riemann integration of bounded functions and its various properties, monotone functions. Types of discontinuities, Lebesgue measure, Lebesgue integral. Functions of several variables, directional derivatives, partial derivative. Total derivative, mean value theorem for differentiable functions.

2. COMPLEX ANALYSIS

Algebra of Complex numbers, complex planes, functions of a complex variable. Continuity, differentiability, CR-equations, analytic functions. Necessary and sufficient condition for analyticity, harmonic functions, harmonic Conjugate, contour integration. Cauchy integral theorem, Cauchy's Integral Formula, Liouville's theorem, maximum modulus principle, fundamental Theorem of algebra. Morera's theorem, Schwarz lemma, open mapping theorem, Taylor series expansion. Elementary Linear Transformations, Mobius transformation, conformal mapping, singularities and its types, Riemann's theorem on removable singularities, Laurent's series expansion, Hurwitz theorem, Cauchy residue theorem, integrals of rational and trigonometric functions by residue theorem.

3. TOPOLOGY

Definition of a metric space, Examples, Open and closed sets, compactness in metric spaces, continuity, uniform continuity, complete metric spaces, Topological spaces, Definition and examples, Elementary Properties, Interior, exterior and boundary of a set, closure of a set, Kuratowski Axioms, Neighbourhood system, Local base and base, subspaces and relative topology, continuous maps, open maps, closed maps and their characterization, Homeomorphism, Separation Axioms, Lebesgue Covering lemma. Product topology, weak topology, compactness and connectedness in topological spaces, Tychnoff's theorem.

4. FUNCTIONAL ANALYSIS

Contraction mapping, Banach Contraction principle, Application to differential and integral equation, Baire's category theorem and its application, Arzela-Ascoli theorem, Normed linear spaces, Banach space, Finite dimensional normed linear spaces, equivalenceof norms, Quotient spaces, Riesz lemma, Bounded linear operators, dual

spaces, Hahn-Banach theorem and its application, uniform boundedness principles, open mapping theorem, Bounded inverse theorem, Closed graph theorem, Inner product spaces, Cauchy-Schwarz inequality, Pythagorean theorem, Hilbert spaces, Orthogonal complements and Direct sums, Orthonormal sets, projection theorem, Bessel's inequality, Riez Representation theorem.

5. ABSTACT ALGEBRA

Groups, Subgroups, Normal subgroups, Quotient groups Homomorphism, Cyclic groups, Permutation and permutation groups, Cayley's theorem, Class equation, Sylow's theorem, Rings, Ideals, Prime and maximal ideals, Integral domain, Polynomial rings, Eisenstein irreducibility criteria, Fields, Finite fields, Field extensions, Finite modules, Submodules, Cyclic modules, Finite direct sum and product of modules, Finitely generated modules, Quotient modules, Homomorphism, Fundamental theorem, Isomorphism theorem, ACC & DCC, Schur's, Lemma.

6. LINEAR ALGEBRA

Vector spaces, Subspaces, Linear dependence and independence, Basis, Dimension of vector spaces, Linear transformation, Algebra of linear transformations, Matrices, Algebra of Matrices, Rank and determinant of Matrices, Linear equation and solutions, Eigen values and vectors, Cayley-Hamilton Theorem, Matrix representation of a linear transformation, Change of basis, Canonical form, Diagonal forms Triangular form, Jordan forms, cyclic subspaces, Rational canonical form, quotient spaces, bilinear forms, Alternating bilinear form, Symmetric bilinear form, Quadratic form.

7. Differential Equations

First order ODE, linear differential equation with constant coefficients of order n, linear dependence and independence of solution, Wronskian, Method of reduction of order, Method of variation of parameters, power series solution about ordinary points, solution of Legendre equation, Legendre polynomial, Rodrigues Formula, solution of Bessel's equation, Simultaneous differential equations, Total differential equations, Lagrange's and Charpits method of solving PDE's, Cauchy problem for first order PDE's, Classification of 2^{nd} order PDE's, Heat and Wave equation.

8. THEORY OF NUMBER

Divisibility, division algorithm, GCD, prime numbers and related theorems. Fundamental theorem of arithmetic, standard form of an integers, linear Diophantine equations. Necessary and sufficient condition for solution of linear Diophantine equations. Radix representation theorem. Euclid's theorem, infinitude of primes, congruences and properties, CRS and RRS, multiplicative functions, Euler's Totient function, Fermat's little theorem, Chinese remainder theorem, Wilson's theorem and applications.

Order of an element, primitive roots. Quadratic and non-residues. Legendre symbols and Jacobi symbols and their properties. quadratic reciprocity laws, number theoretic functions

viz. $\phi(n)$, $\tau(n)$, $\sigma(n)$ and $\mu(n)$. Perfect numbers, Mobius function, and formula, Farrey fractions.

9. NUMERICAL METHODS

Numerical solutions of algebraic equations, Method of iteration and Newton-Raphson Method, Rate of Convergence, Solutions of systems of linear algebraic equations using Gauss elimination and Gauss-Seidel Methods, Finite differences, Lagrange, Hermite and Spline interpolation, Numerical differentiation and integration, Numerical solutions of ordinary differential equations using Picard, Euler, modified Euler and Runge-Kutta Methods.

10. DIFFERENTIAL GEOMETRY

Curves, differentiable curves, arc length, parameterization by arc length, plane curvature, directed curvature, fundamental theorem for place curves, centre of curvature. Curves in space, tangent, normal and binormal unit vectors, curvature and torsion, Serret Frenet frame. Properties of curves like: Helix, Bertrand-Mete, involute & evolute, curves on spheres. Regular surfaces, co-ordinate charts, differentiable function, Diffeomorphism, tangent plane, unit normal vector, oriented surfaces, angle between two curves, orthogonal parameterization, area and curvature for surfaces. Euler's work on surfaces, principal curvature, line of curvature, Rodrigues Formula, Gauss map, second fundamental form, Meusnier's theorem.

Syllabus for Assistant Professor in Accounting and Taxation

Fundamentals of Accounting: Accounting Principles, Concepts and Conventions, Capital and Revenue Transactions. Accounting Cycle – Charts of Accounts and Codification Structure, Analysis of Transaction, Journal (Day Books): Journal Proper, Cash Book, Bank Book, Petty Cash Book, Bank Reconciliation Statement, Trial Balance, Depreciation, Accounting Treatment of Bad Debts and Provision for Doubtful Debts, Preparation of Final Accounts.

Accounting for Special Transactions: Bills of Exchange and Promissory Notes, Sale of goods on approval or return basis, Consignments, Average due date, Account Current, Hire Purchase and Installment sale transactions, Accounting for Insurance claims for loss of stock and loss of profit, Departmental Accounting, Accounting for Branches including foreign branches, Financial Statements of Not-for- Profit organization.

Partnership Accounts: Final Accounts of Partnership Firms, Admission, Retirement and Death of a Partner including treatment of Goodwill, Dissolution of Partnership Firms, Amalgamation of Partnership Firms, Conversion of partnership firm into a company, Introduction to Limited Liability Partnership and distinction of LLPs from Partnership.

Company Accounts: Definition of Shares and Debentures, Issue of shares and debentures, forfeiture of shares, re-issue of forfeited shares, Preparation of Financial Statements- Statement of Profit and Loss Account, Balance Sheet (as per Schedule III to the Companies Act, 2013) Managerial Remuneration, Profit (Loss) prior to Incorporation, Accounting for Bonus issue and rights issue, Redemption of Preference shares and debentures.

Special Aspects of Company Accounts: Accounting for employee stock option plan, Buy back of securities, Equity shares with differential rights, Accounting for Amalgamation (excluding inter-company holding) and reconstruction, Accounting involved in liquidation of Companies. Accounting for specific Companies: Banking companies, Insurance companies, Holding Companies and Public Utilities.

Cost Accounting: Basic Cost Concepts. Detailed study of Material Costs, Employee Costs, Direct Expenses, & Overheads. Preparation of Cost Sheet and Ascertainment of Profit. Cost Book Keeping: Reconciliation of Costing and Financial Profit, Integrated Accounting System. Methods of Costing: Job Costing, Batch Costing, Contract Costing. Process Costing: Normal and Abnormal Losses, Equivalent Production, Inter-process Profit, Joint and By Products. Operating Costing: Transport, Hotel and Healthcare.

Income Tax: Basic concepts, Income excluding total income, Residential status and scope of total income, Income Heads and how income is calculated under different heads: Salaries, Income from House Property, Income from Business and Profession, Capital Gains, Income from other sources, Deduction from the Gross Total Income, Computation of tax liability and total income of individuals, Residence and Scope of Total Income, Income of other people incorporated in assessee's Total Income, Tax deduction at source, Advance Tax, and Introduction to Tax Collection at Source, Inclusion of other person's income in total income, Set

off, Aggregation of Income or set-off or Carry forward of losses, Provisions for Self Assessment and filing return of Income.

Assessment of Various Entities: Political parties, electoral trusts, and charitable or religious trusts, Companies, Tax Planning, Tax Avoidance & Tax Evasion, Deduction, Collection and Recovery of Tax, Assessment Procedure, Appeals and Revision, Dispute Resolution, Penalties, Offenses and Prosecution, Liability in Special Cases, Miscellaneous Provisions.

International Taxation: Double Taxation Relief, Advance Ruling, An Introduction of Black Money, and Tax Law Implementation, Taxation of E-Commerce Transactions, Tax Treaties: Overview, Features, Application and Interpretation, Anti Avoidance Measures, Overview of Model Tax Conventions, Transfer Pricing, Non-resident Taxation.

Indirect Taxes: Charge of GST, Exemption From GST, Place, Time and Value of Supply, Input Tax Credit, GST in India, Supply Under GST, Tax Invoice: Credit and Debit Note, Payment of tax, Returns, Registration, Accounts and Records; E-way Bill, Payment of Tax, Returns, Import and Export Under GST, Refunds, Job Work, Assessment and Audit, Inspection, Search, Seizure and Arrest, Demands and Recovery, Liability to Pay in Certain Cases, Offenses and Penalties, Appeals and Revisions, Advance Ruling, Miscellaneous Provisions , GST in India, Supply Under GST, Charge of GST, Exemption From GST.

Customs & FTP: Classification of Imported and Export Goods, Valuation under the Customs Act, 1962, Importation, Exportation and Transportation of Goods, Warehousing, Duty Drawback, Refund, Foreign Trade Policy, Levy of and Exemptions from Customs, Types of Duty.

Qualification for the post of Assistant professor in Accounting & Taxation

1. M.Com with adequate knowledge of Financial Accounting, Corporate Accounting & Cost Accounting
2. M.Com with adequate knowledge of Direct & Indirect Tax.

Note: Adequate knowledge indicates that the candidate might have studied the above subjects at the Bachelors or at the Masters level.

Syllabus for Assistant Professor in Cost Accounting

Fundamentals of Accounting: Accounting Principles, Capital and Revenue Transactions. Accounting Cycle – Charts of Accounts and Codification Structure, Analysis of Transaction, Journal (Day Books): Journal Proper, Cash Book, Bank Book, Petty Cash Book, Bank Reconciliation Statement, Trial Balance, Depreciation, Accounting Treatment of Bad Debts and Provision for Doubtful Debts. Preparation of Final Accounts.

Prime Cost & Overheads: Basic Cost Concepts. Elements of Cost: Material Costs, Employee Costs, Direct Expenses, & Overheads. Preparation of Cost Sheet and Ascertainment of Profit.

Cost Book Keeping: Reconciliation of Costing and Financial Profit, Integrated Accounting System.

Methods of Costing: Job Costing, Batch Costing, Contract Costing. Process Costing: Normal and Abnormal Losses, Equivalent Production, Inter-process Profit, Joint and By Products. Operating Costing: Transport, Hotel and Healthcare.

Cost Accounting Techniques: Marginal Costing & Decision Making, Differential Costing. Standard Costing and Variance Analysis: Material and Labour Variances. Overhead Variances & Sales Variances. Budget and Budgetary Control: Fixed and Flexible Budgets, Functional Budgets, Master Budget, Cash Budget, Zero Base Budgeting, & Performance Budgeting.

Management Accounting: Activity Based Costing (ABC), Responsibility Accounting, Divisional Performance and Measurement Control: DuPont Analysis, ROI, Residual Income, & Economic Value Added. Transfer Pricing.

Performance Management: Financial Performance Analysis (including Ratio Analysis, Fund Flow & Cash Flow Analysis, EVA Analysis), Balance Score Card: Design & Application.

Miscellaneous: Inflation Accounting, Learning Curve, Theory of Constraints, Value Chain Analysis, Human Resource Accounting, and Social Responsibility Accounting, Intangible Assets, Value Analysis & Value Engineering.

Goods & Services Tax (GST): Administration, Classification and Levy; Time and Place of Supply; Valuation of Taxation Supply; Input Tax Credit and Payment of GST; Procedural Compliance under GST.

Qualification for Assistant professor in Cost Accounting is as

1. M.Com with adequate knowledge of Cost & Management Accounting.
2. M.Com with adequate Knowledge of taxation.

Note: Adequate knowledge indicates that the candidate might have studied the above subjects in Bachelors or at the Masters level.