GOVERNMENT OF PUDUCHERRY
DIRECTORATE OF SCHOOL EDUCATION
PUDUCHERRY
*****

Puducherry, dt. 06.08.2019.

PRESS NOTE

The Directorate of School Education, Puducherry has issued a modified notification dated 05.07.2019 inviting applications for filling up the posts of Guest Balasevikas, Guest Computer Instructor and Guest Lecturers on contract basis.

Eligible candidates for the above mentioned posts will be selected based on the marks obtained in the open competitive examination (90% weightage) and Employment Exchange Seniority (10% weightage).

The details of the open competitive examination are as follows;

- The examination will be conducted for 90 marks. 70 questions will be based on the main subjects and 20 questions will be on general knowledge and current affairs.
- The duration of the examination will be 2 hours.
- Each correct answer will fetch 1 mark and for every wrong answer, negative mark of 0.25 will be awarded.
- The syllabus for the competitive examination may be downloaded from the website of Directorate of School Education (http://schooledn.py.gov.in) from 06.08.2019 onwards.
- The date and venue of the competitive examination will be published in the website of the Directorate.

06/8/19
(M. KUPPUSAMY)
Joint Director

Kindly Publish/broadcast this news in your Newspaper/Radio/ Television.

06/08/19
(M. KUPPUSAMY)
Joint Director

புதுச்சேரி அரசு
பள்ளிக் கல்வி இயக்ககம்
****

புதுச்சேரி 06.08.2019

செய்திக் குறிப்பு

புதுச்சேரி அரசு, பள்ளிக் கல்வி இயக்ககம் தனது 05.07.2019 தேதியிட்ட மாற்றியமைக்கப்பட்ட அறிவிப்பின் வாயிலாக கவுரவ பாலசேவிகா, கவுரவ கணினி பயிற்றுநர் மற்றும் கவுரவ விரிவுரையாளர் பணியிடங்களை ஒப்பந்த அடிப்படையில் நிரப்ப விண்ணப்பங்கள் பெறப்பட்டுள்ளன.

போட்டித் தேர்வு (90% மதிப்பெண்) மற்றும் வேலை வாய்ப்பக பதிவு மூப்பு (10% மதிப்பெண்) அடிப்படையில் மேற்கூறிய பணியிடங்களுக்கு தகுதி வாய்ந்தோர் தேர்ந்தெடுக்கப்பட உள்ளனர்.

போட்டித் தேர்வு குறித்த விவரங்கள் பின்வருமாறு

- போட்டித் தேர்வு மொத்தம் 90 மதிப்பெண்களுக்கு நடைபெறும். இதில் 70 மதிப்பெண்களுக்கு பாடம் சார்ந்த வினாக்களும், 20 மதிப்பெண்களுக்கு பொது அறிவு மற்றும் நடப்பு விவகாரங்கள் குறித்த வினாக்களும் இடம் பெறும்.
- இப்போட்டித் தேர்வு 2 மணி நேரத்திற்கு நடைபெறும்.
- ஒவ்வொரு சரியான விடைக்கு 1 மதிப்பெண் வழங்கப்படும். ஒவ்வொரு தவறான விடைக்கும் 0.25 மதிப்பெண் குறைக்கப்படும்.
- போட்டித் தேர்வுக்கான பாடத்திட்டங்களை பள்ளிக் கல்வித் துறையின் இணையதளத்திலிருந்து (https://schooledn.py.gov.in) 06.08.2019 (செவ்வாய்கிழமை) முதல் பதிவிறக்கம் செய்து கொள்ளலாம்.
- போட்டித் தேர்வு நடைறும் நாள் மற்றும் இடம் குறித்த விவரங்கள் விரைவில் பள்ளிக் கல்வித் துறையின் இணையதளத்தில் வெளியிடப்படும்.

ம. குப்புசாமி
இணை இயக்குநர்

இச்செய்திக் குறிப்பினை தங்களது நாளேட்டில் / தொலைக்காட்சியில் வெளியிட / ஒளிபரப்ப அன்புடன் கேட்டுக்கொள்கிறேன்

ம. குப்புசாமி
இணை இயக்குநர்

SYLLABUS FOR ENTRANCE EXAMINATION

FOR EMPANELMENT OF VARIOUS CADERS

OF TEACHERS

INDEX

SYLLABUS
GUEST BALASEVIKA

UNIT I

GROWTH AND DEVELOPMENT

Principles of Child Development - Physical Development – Prenatal Period-Stages of Infancy and babyhood- Post Natal Care - Factors affecting Growth and Development for Prenatal and Post natal - Role of Parents and teachers in the growth and development. Development of children below 3 years

UNIT II

NEEDS OF CHILDREN BETWEEN THE AGE THREE TO SIX

Child welfare - school health Programme –Development of good habits, Positive self concept, health and hygiene – health services - Balanced Diet - Malnutrition-Nutritional Deficiency Diseases - Health Education and Community participation – Emotional Problems of the child -- Social needs-Emotional needs - Sensory Integration

Child Cognition I - Perception, Learning and Memory, Child Cognition II - Thinking, Reasoning and Intelligence - Physical Motor Development - Language Development - Evolving Development Profile of Child.

UNIT III

PLAYMATERIALS AND THEIR USE FOR EDUCATION OF PRE SCHOOL CHILD

Games and Play - Story Telling Songs-Music - Simple Dance - Drawing and Painting - Clay Modeling – Chart Reading- Nature Study – Activity Corners - Importance of Art Education.

UNIT IV

DELAYED DEVELOPMENT AND MEANS TO IMPROVE

Guidelines to develop delayed development - Factors causing Delayed Development- Role of Teachers, Parents and Communities Referral Services for Delayed Development Children.

UNIT V

EARLY CHILD CARE AND EDUCATION

ECCE in the NPE 1986 - Significance of ECCE - Organization of ECCE - Créches – Anganvadis - Day Care Centre – Balwadis – Physical Facilities – Educational Programmes For ECCE –Theme Based Programme – Flexibility in the Programme - Curriculum, Equipment, Supervisors and Evaluation.

UNIT VI

KINDERGARTEN EDUCATION

Philosophy of Kindergarten Education - Aims and Functions - Concept and Meaning – Curriculum Methods of teaching-Training Aids and Activities-Merits and Limitation

MONTESSORI SYSTEM OF EDUCATION

Philosophy and Principles in Montessori Curriculum –Methods of Teaching –Advantages and Limitations

UNIT VII

INTERGRATED CHILD DEVELOPMENT SERVICES

Objectives of ICDS - Organization and Beneficiaries – Child Development Project Officer-Anganwadi Helpers

Role of UNICEF in Pre School - Education Anganwadi Workers

Bases of Effective Programme – Balanced Development (Physical, Motor, Sensory Approaches Aesthetic) Sequencing the Programme- Individual and Group needs

Selecting Organization Experience - Extensions and Variation of the Activities – Special Children – Adopting to Individual Needs- Inclusion for Children with Special needs

Organizing and Managing ECCE - Physical Facilities and Learning Materials –Staffing – Mobilizing Community Support.

UNIT VIII

CHILDRENS EMOTIONAL DEVELOPMENT

Knowing and Managing Emotions- Childhood Neuroses –Psycho physiological disorders-Childhood Psychoses.

SYLLABUS FOR GUEST COMPUTER INSTRUCTOR RECRUITMENT

INTRODUCTION TO PROGRAMMING USING C , C++ and PYTHON

Introduction to Problem Solving – Writing algorithms - Flow charts - Tracing flow charts - Problem solving methods - Need for computer languages - Sample Programs written in C –Elements of C Programming- Statements – Arrays Functions – Structures Files and File operations-Object oriented programming concepts using C++ - data types – constructs – pointers – arrays – structures functions – Classes Objects – String Handling - Inheritance – Polymorphism – Function Overloading and Operator overloading -Manipulators - Templates Exception Handling – I/O Streams. Python: Elements- List Tuple – Set – Dictionary – Object oriented programming using python – Files – plotting graphs - Connecting with Web servers and MYSQL

INTRODUCTION TO PC & ITS UTILITIES

Introduction to computers: Basic components - Hardware & Software resources - Number system: Decimal, Binary, Octal, Hexadecimal, conversions - Introduction to Windows operating system, components of windows OS, Desktop properties, GUI - Microsoft Word, Microsoft Excel, Microsoft Power point commands - Introduction to DTP packages: Pagemaker, Indesing, Corel draw, Autocad- Introduction to Internet , Getting connected to internet , internet features, protocols. E- mail, Internet explorer & Outlook express - Introduction to Multimedia elements multimedia applications Multimedia data compression - Multimedia I/O technologies Multimedia application designs.

Open source concepts- E-commerce- Electronic payment systems- Mobile Banking and Internet Banking- Unified payment Interface (UPI) - E-commerce security

OPERATING SYSTEM

Introduction: – Operating Systems – features – Types - Multiprocessor Systems – Distributed Systems Clustered Systems - Real Time Systems — Operating System Services – System Calls System Programs - Process Concept – Process Scheduling Cooperating Processes – Inter-process Communication. Threads: Overview – Threading issues - CPU Scheduling Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - Linux overview: Kernel Architecture – Process, memory, file and I/O management – Inter process communication and synchronization Security. Windows XP - System architecture

Introduction to system software and machine structure : System programs Assembler, Compiler, Interpreter, Operating system- Machine Structure instruction set and addressing modes- Loaders and Linkers- Debuggers

DATA STRUCTURES AND ALGORITHMS

Algorithms: Definitions and notations: standard notations - asymptotic notations – worst case, best case and average case analysis; big oh, small oh, omega and theta notations; Recursive algorithms, analysis of non-recursive and recursive algorithms- Divide and Conquer, Greedy Algorithm, Backtracking algorithms - Analysis of Sorting and Searching: Heap, shell, radix, insertion, selection and bubble sort - Linear, binary and Fibonacci search ,Stacks, Queue and Linked List operations Tree structures.

MICROPROCESSORS AND MICROCONTROLLERS

Intel 8085 and 8086 Microprocessors: Introduction - Need for Microprocessors – Evolution – Intel 8085 Hardware - Architecture - Pin description - Internal Registers – Arithmetic and Logic Unit – Control Unit – Instruction word size - Addressing modes – Instruction Set Assembly Language Programming - Stacks and Subroutines - Timing Diagrams - Evolution of Microprocessors 8-bit, 16-bit and 32-bit microprocessors Microcontroller and architecture.

COMPUTER ORGANISATION AND DESIGN

Number Systems and Boolean Algebra: - Number systems and conversion - Binary arithmetic-Binary codes - Boolean algebra - Basic Theorems - Boolean functions-Canonical forms - Simplification of Boolean functions-Karnaugh maps - Tabulation method- Sequential and Combinational circuits – Memory and Programmable logic Basic Computer Organization and Design: Instruction Codes – Computer Registers Computer Instructions. Micro programmed Control - : Control Memory-Address sequencing- Micro program Example Design of control unit. Computer Arithmetic: Addition, Subtraction, Multiplication, Division algorithms- Floating point arithmetic operations- Decimal arithmetic operations.-Memory Organization: Memory hierarchy – main memory – auxiliary memory Associate memory Cache memory – Virtual memory.

DATABASE MANAGEMENT SYSTEMS

Overview - Data Models - Database System Architecture - History of Database Systems – Types of Databases Applications of Databases- Entity-Relationship Model: Basic Concepts - Relational Model: Structure of Relational Databases – Normalization- SQL: Basic Structure Set Operations - DDL, DML & DCL Commands and all type of queries, Aggregate Functions - Embedded SQL, Dynamic SQL and Other SQL Features. - MYSQL Server and Administration commands

COMPUTER NETWORKS

Introduction to Computer Networks: Need for Networking - Service Description – Internet, Intranet, Extranet – Protocols: HTTP, FTP, TCP/IP, UDP, SMTP, HTTPS, ICMP, ARP – OSI Seven Layers and its services – DNS – Network cabling -Connectionless and Connection-Oriented Services – Circuit and Packet Switching - Routers - Mobile Networks- Multimedia Networking: Internet Telephony RTP – RTCP – RTSP. Network Security: Principles of Cryptography - Firewalls – Application Gateway Attacks and Countermeasures.

WEB TECHNOLOGY

Internet Principles and Components: History of the Internet and World Wide Web- HTML - protocols – HTTP, SMTP, POP3, MIME, IMAP. Web Browsers and Web Servers - Server side Programming Languages – Client Server Architecture – Introduction to PHP – Function and Arrays Conditional statements- Looping structure – Forms and files Connecting PHP and MYSQL- Introduction to JavaScript - JavaScript Core Features – Elements of Javascript - Fundamental Client-Side JavaScript: JavaScript Object Models - The Standard Document Object Model - Event Handling. Using JavaScript: Controlling Windows and Frames - Handling Documents - Form Handling- Using JavaScript: Dynamic Effects: Rollovers, Positioning, and Animation - Web Services: Introduction to Web Services, UDDI, SOAP, WSDL, Web Service Architecture, Developing and deploying web services.

SYLLABUS FOR GUEST LECTURERS

Subject: ARABIC

Communication Skills In Arabic- Literature in Arabic- Translation and Communication in Arabic- Indian Heritage in Arabic- Literature in Arabic- Business Communications In Arabic- Literature in Arabic- Communicative skill in Arabic

Communication Skills In Arabic- Literature in Arabic- Translation and Communication in Arabic- Indian Heritage in Arabic

SYLLABUS FOR RECRUITMENT OF LECTURERS IN FRENCH IN THE SCHOOLS OF PUDUCHERRY

LITERATURE

A. Moyen Age : La Ballade des pendus, François Villon.

B. XVI siècle et XVII siècle :
Quand vous serez bien vieille, Pierre de Ronsard- Essais, Montaigne Phèdre, Jean Racine Le Cid, Pierre Corneille-Le Chêne et le Roseau, Jean de la Fontaine-L'Avare, Molière-Discours de la méthode, René Descartes

C. XVIII et IX siècle :
Lettres persanes, Montesquieu-Zadig, Voltaire-Emile ou l'Education, Jean Jacques Rousseau-Le mariage de Figaro, Beaumarchais-Le lac, Alphonse de Lamartine Le père Goriot, Honoré de Balzac Les misérables, Victor Hugo-Correspondances, Charles Baudelaire Madame Bovary, Gustave Flaubert L'Assommoir, Emile Zola-Sagesse, Paul Verlaine-Oncle Jules, Maupassant

D. XX siècle :
Le pont Mirabeau, Apollinaire-Pour faire le portrait d'un oiseau, Jacques Prévert Liberté, Paul Eluard-La condition humaine, André Malraux-Huis clos, Jean Paul Sartre L'Etranger, Albert Camus La Leçon, Eugène Ionesco- En attendant Godot, Samuel Beckett

GRAMMAR and Language skills

A. Les parties du discours (Parts of speech) : Noms, déterminants, verbes....
B. Vocabulaire
C. Expressions, proverbes....
D. Translation of Sentences, Idioms, Proverbs, Essay writing, Comprehension, dialogues, friendly letters and official letters

CULTURE and CIVILISATION

A. Histoire de France : Rois de France,
L'Age classique-La révolution française- La Troisième République -La grande guerre- La Quatrième République- La Cinquième République-

B. Géographie de France :
Frontières, régions, départements, fleuves, montagnes....
Héritage : Devise, drapeau, hymne national, vins, fromages, monuments historiques, touristiques... Sports

LINGUISTICS and METHODOLOGY OF TEACHING FRENCH AS A FOREIGN LANGUAGE

A. Phonétique, phonologie, théorie de la communication.
B. Morphologie, syntaxe, sémantique, stylistique.
C. Mots-clés de la didactique du FLE. Analyse des méthodes françaises et indiennes.
D. Evolution des méthodes : méthodes traditionnelles, SGAV, approche communicative....
E. CECR : Le Cadre européen commun des références pour les langues.
F. Fabrication des exercices, utilisation des documents authentiques.

****

Hindi syllabus

१ हिन्दीकथासाहित्य कहानी, उपन्यास

कहानीकी परिभाषा, स्वरूपतत्त्व एवंप्रकार, कहानीऔरअन्य गद्य विधाओंअन्तर, हिन्दीकहानीउद्भवऔरविकास, उपन्यास की परिभाषा, स्वरूप, तत्व एवंप्रकारऔरअन्य गद्य विधाओंअन्तर, हिन्दीकहानीउद्भवऔरविकास

२ प्रयोजनमूलकहिन्दी

पत्रकारिता ,सम्पादनकला, मीडियालेखन , प्रमृख जनसंचारमाध्यम, माध्यमोपयोगीलेखन, पत्राचारऔरअनुवाद ।

३ आधुनिकहिन्दीकाव्य

रामधारी सिंह दिनकार की रचनाएँ, नागार्जुन , अज्ञेय , मैथिलीशरणगुप्त, जयशंकरप्रसाद, सूर्यकान्त त्रिपाठीनिरालाआदिकवियों एवंकविताओंका अध्ययन।

४ हिन्दीसाहित्य काइतिहास

कालविभाजन, सीमानिर्धारणऔरनामकरण, आदिकाल की पृष्ठभूमि, विशेषतायें, पूर्वमध्यकाल, भक्ति के उद्भव के कारण, उत्तरमध्यकाल की ढतिहासिकपृष्ठभूमि, रीतिकालीनसाहित्य की विभिन्नकाव्यधारायें ।आधुनिककाल की सामाजिकख राजनैतिकपृष्ठभूमि, भारतेन्दु युग, द्वेदी युग, छायावाद, प्रगतिवाद, प्रयोगवादनयीकविता, समकालीनकविता की विशेषताएँ, प्रमुख साहित्यकारऔररचनाएँ, हिन्दी गद्य की प्रमुख विधाओंकाउद्भवऔरविकास,

५ अनुवादशिक्षण।

अनुवाद की परिभाषाएँ, महत्व, प्रकार, सामान्य सिद्धांत, समस्याएँ, काव्यानुवाद, नाट्यानुवाद, कथानुवाद, अनुवाद के लक्षणऔर योग्यताएँ, औरभाषाविज्ञान

६ राजभाषाप्रशिक्षण।

प्रशासन की व्यवस्थाऔरभाषा, भारत की बहुभाषिकताऔर एक संपर्कभाषा की आवश्यकता, राजभाषाकार्यालयीनहिन्दी की प्रकृति

७ प्राचीनहिन्दीकाव्यऔरकाव्यांग

काव्य कास्वरूप, रसकास्वरूप, शब्दशक्ति, अलंकार, छन्द , विद्यापति, कबीर, जायसीए सूरदास, तुलसीदास, बिहारी, मीराबाई, घनानन्द, भूषणऔरपद्माकर ।

८ हिन्दीनाटकऔर एकांकी

परिभाषाऔरस्वरूप, उद्भावऔरविकास, प्रमुख शैलियाँ

९ हिन्दीभाषा

हिन्दीभाषाकाउद्भवऔरविकास, प्राचीनभारतीय आर्यभाषाएँ, वैदिकतथालौककसंस्कृतऔरउनकीविशेषतायें, मध्यकालीनऔरआधुनिकआर्यभाषाएँऔरउनकीविशेषताएँ, हिन्दी की उपभाषाएँए बोलियोंकापरिचय, हिन्दी के विविध रूप, देवनागरीलिपि ।

१०निबंध औररचना

निबंध काविकास, साहित्यिकनिबंध, सामान्य निबंध, सारलेखन, व्यावहारिकहिन्दीऔररचना।

११ भाषाशिक्षण

स्वरूपऔरप्रयोजन, भाषाकौशल, व्यतिरेकीभाषाविज्ञानऔरभाषाशिक्षण, भाषाअधिगम औरभाषाअर्जन एवंभाषाशिक्षण मेंउसकीउपयोगिता, भाषापरीक्षण औरमूल्यांकनख हिन्दीभाषाशिक्षण

१२ साहित्य स्वरूपऔरविधाएँ

साहित्य काअर्थ, परिभाषा, तत्व, समाज, विविध विधाएँ, दृश्यकलामेंनाटकआदि, श्रव्यकलामेंपद्य आदि, पद्यमंप्रबन्धकाव्य,मुक्तिकाव्य, गद्यमेंउपन्यास, कहानी, आलोचना,जीवनी

१३ भाषाविज्ञान

रूप, एकाकालिक, ऐतिहासिक, तुलनात्मकऔरप्रायेगिक , शाखाएँऔरउपयोगिता, स्वन विज्ञान, रूपविज्ञान, वाक्य विज्ञान, अर्थविज्ञान

Subject: MALAYALAM

Malayalam Poetry- Contemporary Fiction- Malayalam Prose- Literature of Visual Art

Prose, Poetry and Functional Malayalam- Fiction, Drama and General Essay

Fiction and Language Computing- Poetry and Essay- Early Modern Poetry- Cultural History of Ancient Kerala- A)Writings For Print Media B)Functional Malayalam

Modern Poetry- Cultural History Of Modern Kerala- A)Writings For Visual Media
B) Comparative Literature- Environmental Studies

History of Ancient Malayalam Literature- Fiction- A) Sanskrit
B) Visual and Performing Arts

History Of Modern Malayalam Literature- Introduction to Malayalam Software-
A)General Linguistics
B) Screen Play and Film studies

Prosody and Poetics- Literary Theories- Ancient and Medieval Literature- Drama-
A) Folkloristic
B) Feminist Literary Theory and Criticism

Malayalam Grammar- Literary Criticism- General Prose- Translation
A) Introduction to Cultural Studies
B) Eco Aesthetics

பாடத்திட்டம் : தமிழ்

பிரிவு 1 மொழி ஆராய்ச்சியின் தோற்றம் - மொழி இனங்கள் - தமிழின் தொன்மை – உயர் தனிச் செம்மொழி – காலந்தோறும் தமிழ்.

சொற்றொடர் அமைப்பு - சொற்பொருள் மாற்றம்- பேச்சுத்தமிழும் எழுத்துத்தமிழும் - கலைச்சொல்லாக்கம்.

பிரிவு 2 எழுத்து, சொல்(நன்னூல்), யாப்பு (யாப்பெருங்கலக்காரிகை), அணி(தண்டியலங்காரம்) - இறைச்சி, உவமை, உள்ளுறை, படிமம், தொன்மம், குறியீடு,

பிரிவு 3 சங்க இலக்கியங்கள் அகம், புறம்(அவ்வையார், நக்கீரர், பரணர், கபிலர்).

பிரிவு 4 காப்பியங்கள் - சிலப்பதிகாரம்(மதுரை காண்டம்)- கம்பராமாயணம் (கிட்கிந்தா காண்டம்)- பதினெண்கீழ்கணக்கு நூல்கள் (திருக்குறள், நாலடியார்).

சிற்றிலக்கியங்கள் - (குற்றால குறவஞ்சி, தமிழ்விடு தூது, நந்திக் கலம்பகம்,
முக்கூடற்பள்ளு)

பிரிவு 5 பக்தி இலக்கியம் - தேவாரம் - (திருநாவுக்கரசர், சுந்தரர், திருஞானசம்பந்தர், மாணிக்கவாசகர்) திவ்யப்பிரபந்தம்(குலசேகரஆழ்வார், ஆண்டாள், பெரியாழ்வார், நம்மாழ்வார்) – கிருத்துவ இலக்கியம்(தேம்பாவணி), இஸ்லாம் இலக்கியம்(சீறாப்புராணம்).

பிரிவு 6 தற்கால இலக்கியங்கள் தோற்றமும் வளர்ச்சியும் - இலக்கியத்திறனாய்வு,புதுக்கவிதை பாடுபொருள், உத்தி, கவிதை - (பாரதியார்,பாரதிதாசன், வாணிதாசன், சிற்பி பாலசுப்பிரமணியன்,சுரதா),-

சிறுகதை - நாவல் (புதுமைபித்தன், ஜெயகாந்தன், சி.சு.செல்லப்பா, கீ.ராஜநாராயணன், அம்பை) நாடகம் - (மனோன்மணியம், சங்கரதாஸ் சுவாமிகள் - நாடகம் எழுதும் ஆற்றலைச் சோதித்தல், நாடக இலக்கியம், நாடக இலக்கிய வகைகள்.

பிரவு 7 தமிழக வரலாறும் பண்பாடும் - புதுவை வரலாறும் பண்பாடும் (விடுதலைக்குப்பின்)

பிரிவு 8 அறிவியல் தமிழ் - அறிவியல் பயன்பாட்டு சொற்கள்- சுற்றுச்சூழல்கல்வி- இதழியல் - கணினித்தமிழ்/வலைதமிழ்- இணையப் பயன்பாடுகள்- மின்னஞ்சல்

பிரிவு 9 மொழிபெயர்ப்பு தோற்றமும் வளர்ச்சியும் - மொழிபெயர்ப்பின் நெறிமுறைகள் புலம்பெயர் இலக்கியங்கள் - விளக்கம் வரையறை – தமிழர்களின் புலம்பெயர் இலக்கியங்கள் - நாட்டுப்புற இலக்கியங்கள் (ஆ.திருநாகலிங்கம், கே.ஏ.குணசேகரன்) பேச்சுக்கலை – பட்டிமன்றம்- சொற்பொழிவு

பிரிவு 10 தகவல் தொடர்பியல் - தோற்றமும் வளர்ச்சியும் - இன்றைய பயன்பாடும். -வானொலி, தொலைக்காட்சி, திரைப்படம்.

****

ENGLISH

INDIAN WRITING IN ENGLISH

Poetry:-

Sri Aurobindo, 'The Tiger and the Deer', Sarojini Naidu, 'Palanquin Bearers'. Nissim Ezekiel. 'Enterprise', Kamala Das, ' The Old Play House', Shiv. K.Kumar, 'Indian Women'

Prose

Swami Vivekananda, 'Work and its Secret', Dr.Abdul Kalam, "My Visions for India, Nehru 'An Autobiography'.

Drama:

ManjulaPadmanabhan, Harvest, Girish Karnad Tughlaq

Short Stories : R.K.Narayan – 'An Astrologer's Day', Sudha Murthy, 'Humility in Sahyadri Hills'

PROSE

Francis Bacon, Of Studies', Of Truth, Of Friendship, Of Ambition, OliverGoldsmith, 'Manin Black', Joseph Addison, "Sir Roger at Church', Charles Lamb, 'Dream Children', William Hazlitt,"On Reading Old Books", Essays of Elia, Russell, 'An Ideal Individual', G.K. Chesterton, 'Advantages of Having One Leg', Doris Lessing, 'The Golden Book', Orwell, 'Sporting Spirit'

POETRY

William Shakespeare, Sonnet 116 'Let me not to the marriage of true minds', John Donne, 'The Sun Rising', Canonisation, John Milton, 'How Soon Hath Time', Paradise Lost Book IX, John Dryden, 'A Song for St. Cecilia's Day', William Blake, 'Chimney Sweeper', William Wordsworth, 'On Westminster Bridge', Tintern Abbey, S.T.Coleridge, 'Kubla Khan', P.B.Shelley, 'Ode to the Sky Lark', JohnKeats,'Ode to a Nightingale', Ode on a Grecian Urn, Robert Browning, 'My Last Duchess', Lord Tennyson, 'Lotus Eaters', Morte D'Arthur,W. B. Yeats, 'The Second Coming', Byzantium. Ted Hughes, Thought Fox', W.H. Auden, 'Musee De Beaux Arts'

FICTION

Jane Austen, Mansfield Park, Charlotte Bronte, Jane Eyre, Charles Dickens, Christmas Carol , Great Expectations, Virginia Woolf, Mrs. Dalloway, To the Light House

HISTORY OF ENGLISH LITERATURE

Elizabethan Age, Augustan Age., Romantic Age., Victorian Age, Modern Age.

ENGLISH LANGUAGE AND LINGUISTICS

The Nature and scope of Linguistics. Phonetics, Phonology, Morphology, Syntax

COMMUNICATION SKILLS

Effective communication / miscommunication, The secrets of good conversation, Telephone conversation, Interviews, Group Discussion, Public Speech –Compering.

BRITISH DRAMA

Drama - Origin and development of British Drama. Marlowe,Doctor Faustus, Oscar Wilde,The Importance of Being Earnest, T.S. Eliot, Murder in the Cathedral, Osborn, Look Back in Anger

LITERARY FORMS

Literary Terms, Poetry, Prose, Drama, Fiction

WRITING SKILLS

Formal and Business communication, Note Making, Abstract, Report writing (Agenda, Minutes & Reports),Paragraph & Digital communication

ENGLISH FOR COMPETITIVE EXAMINATION

Basics of English, Spotting Errors, Sentence Completion, Reading comprehension, Précis Writing, Foreign Expressions, Idioms and Phrases, Letter Writing Writing, Reports, General Essays

LITERARY CRITICISM

Classical – Aristotle, Horace, Longinus, Dr. Johnson – Preface to Shakespeare, Matthew Arnold -"The Study of Poetry", I.A. Richards - "Four Kinds of Meaning", T S Eliot:"Tradition and Individual Talent"

SHAKESPEARE

Introduction to Shakespeare, Macbeth, The Tempest, Julius Caesar, As You Like it, Measure for Measure

AMERICAN LITERATURE

PROSE:

Emerson `Self Reliance'

POETRY

Walt Whitman – "O Captain My Captain", Emily Dickinson -"Success is counted sweetest", Robert Frost – "Birches", Sylvia Plath–"Lady Lazarus", Maya Angelou "When the Caged Bird sings".

DRAMA

Eugene O'neil Hairy Ape

FICTION

Hemingway – Old Man and the Sea, Alice Walker –In search of My Mother's Garden

POST-COLONIAL LITERATURE

New Literatures in English:Cultural Nationalism in a Changing Worldby Bruce King, Introduction in Empire Writes Back by Bill Ashcroft,Garreth Griffith and Helen Tiffins, Routledge, London, 2003.

POETRY

Atwood – 'Photograph of me', Emily Liang 'United We Stand', A.D. Hope 'Australia', Allen Curnow –'House and Land'

DRAMA

Douglas Stewart – Ned Kelly

FICTION

Chimamanda Adichi Purple Hibiscus

SHORT STORY

Chinua Achebe -'Marriage is a Private Affair'

ENGLISH FOR MASS MEDIA

James Glen Stovall – Writing for the Mass Media, Pearson, 1985., Srivastava-News reporting and Editing, Sterling publishers, 2013.

SOFT SKILLS

Team work, Emotional Intelligence, Adaptability, Leadership, Problem Solving

Translation studies

Translation Theories, History of Translation, Key concepts in Translation Studies, Problems of Translation, Recent Translation Theories

LITERATURE IN TRANSLATION

A.K.Ramanujan – "Hymns for the Drowning" V.V.S.Iyer– "Thirukkural", Pablo Neruda – "Ode to Hope", Octavia Paz "No More Clichés", Pushkin –"The Tale of Tsar Saltan", Jayamohan – "The Elephant Doctor", Thagazhi Sivasankaram Pillai – Chemeen, Antoine de Saint-Exupéry- The Little Prince, Herman Hesse – Siddhartha

CONTEMPORARY LITERARY THEORIES

Marxism, Subaltern Studies, Post Colonialism, Post Modernism, Eco-criticism. Gender Studies

WOMEN WRITING

POETRY

Elizabeth Bishop- 'I am in Need of Music', Halina Poswiatowska- 'It's we who gave birth…',
Adrienne Rich – 'Diving into the Wreck' GaurieDesponde 'Female of the Species'

PROSE

Leila Seth - Talking of Justice (Chapter on women's rights) Chandra Talpade – "Under Western Eye"

SHORT STORY Mahaswetha Devi –Rudali

FICTION MonicaAli -The BrickLane, Lights and Shadows(Collection of Short stories)

ENVIRONMENTAL CONSCIOUSNESS THROUGH A STUDY OF LITERATURE

POETRY

William Shakespeare – "Sonnet 20" John Keats – 'Bright Star, Would I Were' Wallace Stevens- 'The Snow Man' Robert Frost – 'Stopping by Woods on a Snowy Evening'. Rabindranath Tagore – 'She Dwelt on the Hill side' Sarojini Naidu – 'AutumnSong'.

PROSE Thoreau –'Where I lived and what I lived for'

DRAMA :Chekhov – The Cherry Orchard

FICTION IndraSinha -Animal's People

INDIAN CULTURE THOUGH LITERATURE

Prose: Sri Aurobindo-'The Renaissance in India', A.K Ramanujan- 'Where Mirrors are Windows' Michel Daniino- 'Effects of Colonisation'

Poetry: Swami Vivekananda-"Angel Unawares", Rabindranath Tagore –"Freedom" Toru Dutt –"Lakshman"
Drama GirishKarnad - Nagamandala

Fiction NeelaPadmanaban- Generations

Short stories DevduttPattanaik -Indian Mythology

For the post of Written Recruitment Test for the post of Lecturer

Syllabus: Mathematics

THEORY OF EQUATIONS AND TRIGONOMETRY

Relations between the roots and the coefficients of a general polynomial equations in one variable–Transformation of equations– Descarte's rule of signs. Solution of cubic equations :Cardon's Method - Trigonometrical method–Horner's Method, Bi-quadratic equation–Ferrari method. De Moivre's theorem and its applications–Direct and Inverse circular and hyperbolic functions. Logarithm of a complex quantity-Expansion of Trigonometrical functions. Gregory's series-Summation of series.

DIFFERENTIAL CALCULUS

n^{th} derivative – Standard results – Trigonometricaltransformation – Formation of equations involving derivatives Leibnitz formula.Total differential coefficients – Euler's theorem – Partialderivatives of a function of two functions -Equations of tangent and normal - Taylor expansions of single and double variables.Maxima and Minima of two variables – Lagrange's methodof undetermined multipliers - Angle of intersection ofcurves- Sub tangent and Sub Normal. – Angle between the radius vector and tangent – Angle between the intersection of two curves – Polar sub tangent and sub normal.Circle, radius and centre of curvature Cartesian formula forradius of curvature – envelope.

ANALYTICAL GEOMETRY - 3D

Angle between 2 lines-projections-direction cosines-relation betweenthe direction cosines of a straight line-the projection of the line joining $P(x_1,y_1,z_1)$ and $Q(x_2,y_2,z_2)$ on any line with d.c.'s l,m,n.-direction cosines of any line joining 2 points-angle between the lineswhose direction cosines are (l_1,m_1,n_1) and (l_2,m_2,n_2).General equation, angle between two planes, length of perpendicular from a given point to a plane, equations of the plane bisecting the angle between two planes.Symmetrical form,line through two points, reduction of unsymmetrical form to the symmetrical form - condition for a line to lie on a plane - plane through a line - condition for the two lines to be coplanar (Cartesian form) - equation of the plane containing two lines - Tofind the shortest distance between two skew lines - equation of the shortest Distance in Cartesian. Equation of a sphere with given centre and radius - general equation of a sphere - diameter form - and circular section.Equation of a Cone with its vertex at the origin - equation of a quadratic cone with given vertex and given guiding curve - necessary condition for general equation of second degree to represent a cone - circular cone - equation of circular cone with given vertex - axis andsemi vertical angle.

INTEGRAL CALCULUS

Integration of rational algebraic functions - Integration of irrational algebraic functions - Properties of definite integrals Integration by parts – Bernoulli's formula – Reduction formulae Evaluation of double integral – Changing of order of integration- Double integral in Polar co-ordinates – Triple integral Jacobian – Change of variables in the case of two variable and three variables - Transformation from Cartesian to polar co- ordinate - Transformation from Cartesian to spherical co-ordinates –Properties – relation between Beta and Gamma functions - Recurrence formula.

ABSTRACT ALGEBRA

Definition of Group - examples of groups- Some preliminary lemmas - Subgroups. A counting principle - Normal subgroups and Quotient Groups – Homomorphisms.Automorphisms - Cayley's theorem - Permutation groups. Definition of Ring- examples of a rings - Some special classes of rings - Homomorphisms – Ideals and quotients rings.More ideals and quotients rings -The field of quotients of an integral domain.

LINEAR ALGEBRA

Vector spaces - Elementary Concepts subspaces Linear independence - Bases - Dual spaces Inner product spaces Algebra of Linear transformations - Characteristic roots. Matrices : Canonical forms - triangular forms

REAL ANALYSIS

Sets and elements - Operations on sets — Functions - Real valued functions-Equivalence—Countability—Real numbers—Leastupper bound — Greatest lowerbound.Definition of sequence and subsequence — Limit of a sequence — Convergent sequence - Bounded sequence Monotone sequence - Operation on convergent sequence - Limit superior and limit inferior Cauchy sequence Convergence and divergence- Series with non - negative terms – Alternating series—Conditional convergence and absolute convergence- Tests for absolute convergence-Series whose terms form an on-increasing sequence - Summation by parts.Limit of a function on the real line - Metric spaces (Examples 4 and 5 under 4.2 e to be omitted) - Limits in metric spaces. Functions continuous at a point on the real line Reformulation Functions continuous on a metric space - Open sets and closed sets – Discontinuous functions on R More about open sets-Connected sets. Bounded sets and totally bounded sets-Complete metric spaces. Compact metric spaces Continuous functions on compact metric Spaces-Continuity of the inverse function-Uniform continuity Sets of measure zero - Definition of the Riemann integral - Existence of the Riemann integral- Properties of the Riemann integral Derivatives - Rolle's theorem - The Law of the Mean - Fundamental theorem of Calculus - - Improper integrals.Hyperbolic function - The exponential function - The logarithmic function - Definition of x^a - The trigonometric function - Taylor Theorem -L'Hopital's rule.

LOGIC AND LATTICES

Connectives negation – conjunction – disjunction – statement formulas and truth tables – Conditional and bi conditional - well formed formulas tautologies – equivalence of formulas duality law – tautological implicationsNormal forms – disjunctive normal forms – conjunctive normal forms principal disjunctive normal forms – principal conjunctive normal formsPartial ordering - lexicographic ordering – Partially ordered set Hasse diagram – least member - greatest member – minimal member – maximal member least upper bound – greatest lower bound Lattice – examples – properties of lattices – lattices as algebraic systems – sub lattices – direct product homomorphism – order preserving – Special lattices– complete lattice – bounded lattice – complement complemented lattice – distributive latticeBoolean algebra - - properties – examples – sub algebra – direct product homomorphism Boolean functions – karnaugh maps for one variable – two variables – three variables

VECTOR CALCULUS

Gradient of a scalar function –properties – directional derivatives -- Divergence of a vector function – Curl of a vector function–related problemsVector identities Line integrals – related problems Surface integrals – Volume integrals Green's theorem – Stokes's theorem – Verification of theorems Gauss divergence theorem – Verification of theorem.

COMPLEX ANALYSIS

Complex numbers - Definitions - Algebraic properties – Cartesian co-ordinates - Triangular inequality - Polar Form - Powers and roots - Region in the complex plane .Analytic functions - Functions of a complex variable - Mapping - Limit - Theorems on limits - Continuity - Derivatives - Differentiation formula - Cauchy Riemann equations – Sufficientconditions Cauchy Riemann equations in polar form - Analytic functions - Harmonic functions.Elementary functions - Exponential function - Trigonometric functions and their--properties - Hyperbolic functions – Logarithmicfunction - Branches - properties of logarithms - Complex exponents - Inverse trigonometric & hyperbolic functions.Mapping by elementary functions - The linear function 1/z - Linear fractional transformation - The function $w = \exp(z)$,$W = \sin z$, $W = \cos z$, $z^{1/2}$ - Successive transformation W= z + 1/z.Contour integrals- - Examples - The Cauchy Goursat's theorem - A preliminary lemma - Proof of Cauchy Goursat's theorem - Simply and multiple connected domains.The Cauchy integral formula -Derivatives of analytic functions - Morera's theorem - Maximum moduli of functions-Liouville's theorem- The fundamental theorem of algebra.Convergence of sequences and series-Taylor series - Observations and examples – Laurent Series (statementonly).Singularities - Definitions and examples - Residues - The residue theorem - The principal part of a function - Residues and poles – zeros and poles of orderm.

OPERATIONS RESEARCH

Mathematical formulation of LPP Graphical Solution of LPP – Definition of LPP – Canonical and Standard forms of LPP – Ordinary Simplex Method to solve LPP (Method and problemsonly) – Uses of Artificial variables Method (Big – M Method) - Two Phase MethodDuality in LPP – Conversion of Primal to Dual – Duality and Simplex Method (Method and problems only) – Dual SimplexMethodGeneral Transportation Problems Finding IBFS for Transportation Problems - North-West corner Method Least Cost Method – Vogel's approximation Method Test for Optimality Degeneracy in Transportation Problems – MODI Method–Unbalanced Transportation Problems Mathematical formulation of Assignment Problems – Assignment Method – Travelling Salesman ProblemsTwo person zero sum game – MAXIMIN MINIMAX Principle – Saddle Point – Games without Saddle Point – Graphical solutions of2 x n and m x 2 games – Dominance Property – General solution of m x n games by LPPNetwork and Basic Components – Logical sequence - Rules for Network Construction – Critical Path Analysis - Probability Considerations in PERT– Difference between PERT and CPM

Deterministic inventory Models

1. Uniform rate of demand infinite rate of production, noshortage
2. Uniform rate of demand, Finite rate of replenishment , noshortages
3. Uniform rate of demand, instantaneous Production withshortages

Uniform rate of demand, instantaneous Production with shortages and fixedtimeQueueing Systems – Elements of Queueing systems – Characteristics of queueing Systems – Distribution of Arrivals – Distribution of Inter arrival time – Classification of queueing Models Deriving Steady state Probabilities for M/M/1 queueing systems - System Measures – Little formula - Deriving Steady state Probabilities for M/M/1 queueing systems with finite capacity - System Measures – Related Problems.Multi server queueing Model - Deriving Steady state Probabilities for M/M/c queueing system - System Measures – Deriving Steady state Probabilities for M/M/c queueing system with finite capacity – SystemMeasures – Related Problems.Methodology of Simulation – Event type simulation – Generation of random numbers – Monte – Carlo Simulation on Inventory Problems - simulation of Queueing Systems.

ORDINARY DIFFERENTIAL EQUATIONS

Exact differential equations – Equations of the First, but of higher degree – Equations solvable for dy/dx, solvable for y, solvable for x, Clairaut's formLinear Differential equations with constant coefficients - Linear differential equations with variable coefficients.Method of Variation of parameters – Simultaneous Linear differential equations with constant coefficientsLaplace transform – basic properties – transforms of derivatives and integrals functions – derivatives and integrals of transforms – transforms of step function and impulse functions – transforms ofperiodic functionsInverse Laplace transforms – convolution theorem initial and final value theorem – solution of linear ODE of second order withconstant coefficients using Laplace transform.

MECHANICS (STATICS)

Definition of a Force-Types of Forces: Gravity, Tension, Resistance, Friction-Magnitude and Direction of the Resultant of Forces on a particle - Equilibrium of aParticle.Equilibrium of a Particle acted on by Three Forces-The Triangle of forces-Necessary and Sufficient conditions for the Equilibrium of a Particle under Three Forces- Lami's Theorem--Necessary and Sufficient conditions for the Equilibrium of a Particle under a System of Forces-Equilibrium of a Particle on a Rough Inclined Plane.Equivalent Systems of Forces-Resultant of Parallel Forces- Couples-Resultant of Several Coplanar Forces-Moment of the Resultant Force -Varignon's Theorem-Couples in a Plane or in Parallel planes- Resultant of a Couple and a Force.Equation of the Line of action of the Resultant-Equilibrium of the Rigid body under three coplanar forces.Equilibrium of uniform homogeneous string- Sag-Suspension Bridge

MECHANICS (DYNAMICS)

Velocity- Relative Velocity- Acceleration- Angular Velocity- Relative Angular Velocity-Rectilinear Motion- Work, Power and Energy.Central Forces and Central Orbit- Equations of a Central Orbit- Law of Force and Speed for a given Orbit- Determination of the orbit when the law of force is given- Kepler's laws of Planetary motion.Motion of a Projectile- Nature of a Trajectory-Results Pertaining to the motion of a Projectile-Maximum Horizontal Range- Trajectories with a given speed of projection and a given horizontal range- Speed of a Projectile- Range on an Inclined plane- Maximumrange on the inclined plane- Envelope of the trajectories. Definition of Simple Harmonic Motion- Composition of two Simple Harmonic Motions of the same period. Moment of Inertia-Theorems of moment of Inertia – Theorem of Perpendicular axes- Theorem of parallel axes.Two Dimensional Motion of a Rigid Body- Motion of a Rigid Body rotating about a fixed axis- Compound Pendulum- Reaction of the axis on a rigid Body revolving about a fixed axis-Equations of Motion for a two dimensional Motion- Motion ofa uniform disk rolling down an inclined plane.

MATHEMATICAL STATISTICS

Random variables – Distribution function – Discrete random variable – Continuous random variable – Continuous distribution function – Two dimensional random variables Joint probability function – Mathematicalexpectation and variance.Moment generating function – Properties of MGF – Cumulants – Properties of Cumulants – Characteristic function – Properties of characteristic function – Tchebychev's inequality. Binomial distribution Moments of binomial distribution – Recurrence relation for the moments of binomial distribution – MGF of Binomial distribution – Characteristic function of Binomial distribution – Fitting abinomial distribution.Poisson distribution – Moments of the Poisson distribution – Recurrence relation for moments of Poisson distribution – Moment generating function of Poisson distribution – Characteristic function of Poisson distribution Fitting a Poisson distribution. Normal distribution – Properties of normal distribution – Mode, Median, MGF, Moments Points of inflexion, Median deviation about mean, Area property of Normal distribution – Problems using area Properties.Correlation – Properties - Rank Correlation

Bivariate correlation Regression – Properties – Regression equationsSampling – Types of sampling · Parameter and statistics ·· Test of significance – Null hypothesis – Alternate hypothesis – Procedures in testing of hypothesis errors in sampling critical region – level of significance Test of significance of large sampling – Test of significance of single mean – Test of significance of difference between two means – test of significance of proportion – test of significance of difference between two proportions – test ofsignificance of difference between two standard deviation Chi square test (definition) – chi square test for test of goodness of fit – independence of attributes – student's t · distribution (definition) – t-test for single mean – t- test for difference between two means – t–test for dependent sample – t-test for co-efficient of Correlation.

PARTIAL DIFFERENTIALEQUATIONS

Formation of Partial differential equations by elimination of arbitrary constants – by elimination of arbitrary functions – Singular integral General integral.Standard types of first order equations · Standard 1,2,3.4 - Equations reducible to standard forms.Lagrange's equations - Charpit's Method. Linear Partial Differential equation of Second and higher order with constant coefficients. One dimensional wave equations, heat equation, Laplace equation – Simple problems.

NUMERICAL METHODS

Numerical solution of algebraic and transcendental equations – Bolzano's bisection method - Successive approximationmethod– Regula falsi method – Newton-Raphson method.Numerical solution of simultaneous linear algebraic equations Gauss elimination method - Gauss Jordan elimination method – Gauss Seidel iteration method.Finite difference operator - Interpolation Newton-Gregory forward and backward interpolation – Newton's divided difference formula – Lagrange's interpolation formula for uneven intervals – Gauss interpolation formula – Numericaldifferentiation – Numerical Integration – Trapezoidal rule – Simpson's $1/3^{rd}$ rule.Numerical solutions of Ordinary differential equations of first and second order – Simultaneous equations – Taylor series method – Picard's method.Euler's method – Improved Euler's Method - Modified Euler's Method – Runge-Kutta method of second and fourth order Milne's predictor corrector method.

PHYSICS

UNIT-I: MECHANICS OF PARTICLES and RIGID BODIES

Laws of Motion:
Vector algebra - Scalar and vector products Derivatives of a vector with respect to a parameter limited to cartesian co-ordinates and plane polar co-ordinates – Ordinary differential equations: First order homogenous differential equations and second order homogenous differential equations with constant coefficients – Newton's Laws of Motion Angular Velocity – Angular Momentum and Torque – Law of Conservation of Angular Momentum.

Gravitation :
Newton's Law of Gravitation – Keplar's Laws – Basic ideas of Global Positioning System (GPS). gravitational Potential and Field – Potential due to Uniform solid sphere and Spherical Shell.

Dynamics of Rigid Bodies:
Degrees of freedom -- Moment of Inertia – Radius of Gyration – Theorems of Moment of Inertia – Moment of Inertia of a circular disc – Solid sphere and Hollow sphere – Moment of Inertia of a Diatomic molecule – Kinetic Energy of rotations- Rotational Energy states of diatomic molecules.Precessional motion(qualitative)--Gyroscope. Rotational frames – Centrifugal and Coriolis forces – Foucault pendulum – Dynamics of system of particles Centre of Mass – Collision: Direct impact of two smooth spheres, Determination of final velocities and Loss of kinetic energy.

ELASTICITY, VISCOSITY AND SURFACE TENSION:
Moduli of elasticity work done in a strain Torsional Pendulum – Determination of Rigidity Modulus– Bending of beams -- bending moment - Young's Modulus – Uniform and non-uniform bending – Equation of continuity – Energy of a liquid-Euler's equation – Bernoulli's theorem Applications. Critical velocity, Poiseullie's formulae co-efficient of viscosity--Terminal Velocity and Stokes formula – Variation of Viscosity with temperature and pressure – Surface Tension – Molecular interpretation Drop weight method.

UNIT II: KINETIC THEORY AND THERMODYNAMICS

Laws of Thermodynamics: Thermodynamic Description of system, Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermo dynamical Processes, Applications of First Law: General Relation between CP & CV, Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient, Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy- temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.

Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh Jeans

Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law.

Statistical Mechanics: Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law - distribution of velocity - Quantum statistics - Fermi-Dirac distribution law - electron gas - Bose-Einstein distribution law - photon gas - comparison of three statistics.

UNIT III: OSCILLATIONS, WAVES AND ACOUSTICS

Superposition of Two Harmonic oscillations: Two collinear harmonic oscillators, Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats), Two perpendicular harmonic oscillators, Graphical and Analytical Methods. Lissajous Figures with equal an unequal frequency and their uses.

Waves Motion- General: Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, Wave intensity.

Sound: Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem-Application to saw tooth wave and square wave - Wave intensity. Speed of longitudinal waves in a fluid - velocity of sound in air - dependence on pressure and temperature - normal mode vibrations of air columns.

UNIT IV: OPTICS

Ray Optics: Fermat's principle and its applications: Principle of extreme path, Proof of laws of reflection and refraction, paraxial approximation, matrix method in paraxial optics, ABCD matrix.

Reflection and refraction:

Snell's law of reflection and refraction, reflection and refraction at spherical surfaces: formula for refraction at single spherical surface, sign convention. Thick lens: matrix methods in paraxial optics, basic ideas of unit planes and nodal planes, Cardinal points of an optical system , general relationship, combination of thin lenses.

Aberration in images: chromatic aberrations; achromatic combination of lenses in contact and separated lenses. Monochromatic aberrations and their reduction. Properties of wavefront, Huygen's principle.

Interference and diffraction:

Interference of light: The principle of superposition; two slit interference, coherence requirements for the sources, localized fringes in thin films, transition from fringes of equal thickness to those of equal inclination Michelson interferometer; its uses for determination of wavelength, wavelength difference and standardization of the meter. Intensity distribution in

multiple beam interference; Fabry - Perot interferometer and concept of finesse.

Fresnel diffraction: Half-period zones, circular apertures and obstacles, straight edge, explanation of rectilinear propagation. Cornu Spiral and its applications Babinet's Principle.

Fraunhofer diffraction:

Diffraction at a single slit, a circular aperture and a circular disc. Resolution of images; Rayleigh criterion, resolving power of a telescope and a microscope -Outline of phase contrast microscope (no derivations).Diffraction grating: Diffraction at N parallel slits; plane diffraction grating, resolving power of gratings and prisms.

Polarization Optics: Electromagnetic nature of light. Transverse nature of light waves. Plane polarized light production and analysis. Circular and elliptical polarization. Double refraction, interference of polarized light, phase retardation plates (quarter wave and half wave plates).

UNIT V: ELECTRICITY AND MAGNETISM

Vector Analysis: Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only).

Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

Magnetism: Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials.

Maxwell's equations and Electromagnetic wave propagation: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field, Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.

UNIT VI: MODERN PHYSICS AND RELATIVITY

Planck's quantum, Planck's constant and light as collection of photons; Photo – electric effect and Compton scattering. De Broglie wavelength and matter waves; Davission-Germer experiment Problems with Rutherford model instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and Atomic stability; calculation of energy levels for hydrogen atoms and their spectra.

Special Theory of Relativity: Constancy of speed of light. Postulates of Special theory of Relativity. Length contraction. Relativistic addition of velocities.

UNIT VII: QUANTUM MECHANICS

Time dependent Schrodinger equation: Time dependent Schrodinger equation and dynamical evolution of a quantum state; Properties of Wave Function. Interpretation of Wave Function Probability and probability current densities in three dimensions; Conditions for Physical Acceptability of Wave Functions. Normalization. Linearity and Superposition Principles. Eigenvalues and Eigen functions. Position, momentum & Energy operators; commutator of position and momentum operators; Expectation values of position and momentum. Wave Function of a Free Particle.

Time independent Schrodinger equation-Hamiltonian, stationary states and energy eigenvalues; expansion of an arbitrary wave function as a linear combination of energy eigen functions; General solution of the time dependent Schrodinger equation in terms of linear combinations of stationary states; Application to the spread of Gaussian wave packet for a free particle in one dimension; wave packets, Fourier transforms and momentum space wave function; Position-momentum uncertainty principle.

General discussion of bound states in an arbitrary potential- continuity of wave function, boundary condition and emergence of discrete energy levels; application to one-dimensional problem- square well potential; Quantum mechanics of simple harmonic oscillator-energy levels and energy eigen functions.

Quantum theory of hydrogen-like atoms: time independent Schrodinger equation in spherical polar coordinates; separation of variables for the second order partial differential equation; angular momentum operator and quantum numbers; Radial wavefunctions; Orbital angular momentum quantum numbers l and m; s, p, d,.. shells (idea only).

UNIT VIII: ELECTRONICS

Current density and current. Non-steady currents and continuity equation. Kirchoffs laws. Network theorems and their applications. Non-Ohmic circuitry, thermistor. Varying current: Rise and decay of currents in LR, CR circuits and LCR circuits - resonance. Time constant. Integrating and differentiating circuits.

Junction diode, special diodes, and their general uses: Network theorems and their applications, Classification of Conductors, insulators and semi-conductors on the basis of energy band diagram-Intrinsic and extrinsic semiconductors. P-type and N-type semi-conductors. Formation of PN junction diode – Forward and reverse characteristics – Diode resistance-Effect of temperature on extrinsic semiconductors, Halfwave, Centre tap and Bridge rectifiers, Expression for average dc voltages, qualitative ideas of filters, clipping and clamping circuits-their general applications. Zener diode – Volt – ampere characteristics-Avalanche and Zener break down mechanisms - Zener voltage. Simple voltage regulator circuit using zener diode. LED, Photodiode.

Bipolar junction transistors, biasing and hybrid parameters: Construction of NPN and PNP transistors – their operation modes-operation of NPN and PNP transistors-CB, CE and CC configurations and their biasing, Input, Output and transfer characteristics of BJTs in CB and CE modes-Active, saturation and cut-off regions -Bias stability- Load line analysis-operating point.The need of transistor biasing for faithful amplifications. Variations of transistor parameters – stability factor and stabilization Thermal runaway-Methods of transistor biasing –Base bias with emitter feedback- Voltage divider bias, h-parameters of a transistor and their notations-hybrid equivalent circuits for CE, CB and CC mode transistors. Single stage RC coupled amplifier, calculation of mid frequency gain using h-parameters, frequency response curve (qualitative).

UNIT IX: SOLID STATE PHYSICS

Basics of Crystallography: Crystal geometry: Crystal lattice; crystal planes and Miller indices, unit cells. Typical crystal structures; coordination number, packing fraction. Symmetry elements; rotation, inversion and reflection, basics of point groups and crystal classes, space groups, reciprocal lattice Crystallography: Diffraction of X-rays by a crystal lattice. Laue's formulation of X- ray diffraction, Laue spots rotating crystal.

Bonding and Lattice Vibrations Types of bonding in solids: Covalent, Ionic, metallic and Vander Waals bonding, hydrogen bond. Lattice Vibrations: Elastic and atomic force constants; Dynamics of chain of two types of atoms, optical and acoustic modes, interaction of light with ionic crystals. Einstein's and Debye's theories of specific heats of solids.

Electrical Conduction in Solids: Conduction in metals: Drude's theory, DC conductivity, Hall effect and magneto resistance, AC conductivity, plasma frequency, thermal conductivity

of metals, Fermi-Dirac distribution, thermal properties of free-electron gas. Conduction in semiconductor: Bands in solids; metals, insulators and semiconductor – electrons and holes-effective mass, donor and acceptor impurity levels.

Magnetic Properties of Solids: Magnetism: Diamagnetism, Paramagnetism due to free ions and conduction electron Curie's law, ferromagnetism, domains, hysteresis loop, outline of antiferro- and ferrimagnetism, ferrites. Superconductivity: Zero resistivity; critical temperature, critical B field. Meissner effect Type I and Type II super conductors, specific heat and thermal conductivity.

UNIT X: ATOMIC AND MOLECULAR SPECTROSCOPY

Atomic and X-ray Spectra: Atomic spectra, Coupling schemes, L-S, J-J couplings, Spectral terms, s,p,d,f, notation, selection rules. Spectra of mono-and di-valent atoms: Doublet fine structure of hydrogen lines; screening constants for mono valent atoms, series limits, doublet structure of alkali spectrum. X-ray spectra: The continuum X-ray spectrum; Duane and Hunt limit. Characteristic X-rays; Moseley's law, doublet fine structure, X-ray absorption spectra, absorption edges.

Effect of magnetic field on energy levels: Angular momentum and magnetic moment of electron due to orbital motion Gyromagetic ratios for orbital and spin motions; Bohr magneton, vector model, Lande g factor, Normal and anomalous Zeeman effects with reference to sodium D-lines

Rotation and Vibration of Molecules: Classification of molecules as various tops, Rotational energy levels of diatomic molecules (no derivation), inter nuclear distance. Pure rotation spectra; selection rules, isotope effects on rotational energies. Vibrational energy levels, force constants, anharmonicity, dissociation energy, Spectra of diatomic molecules: Vibration-rotation spectra; selection rules, P, Q and R branches.

Electronic levels, Raman Effect: Sharing of electrons; formation of molecular orbitals, molecular orbitals in H_2^+ ion, MO theory of H_2 molecule, diatomic molecular orbitals, molecular orbital energy level diagram. Electronic band systems, sequences and progressions, Franck-Condon principle. Raman effect: Stokes and anti-Stokes lines, quantum theory of Raman effect, selection rules in Raman and IR spectra.

Laser System, Types and Applications: Origin of spectral width, Schalow-Townes limit (only statement), Purity of a spectral line; Coherence: spatial and temporal, Einstein's A and B coefficients; Conditions for laser action; existence of a metastable state, population inversion by pumping and cavity resonance condition. Ruby Laser, He-Ne Laser, Dye laser; Applications of lasers: Laser communication, Medical applications and Material processing. Elementary idea of second harmonic generation.

UNIT XI: DIGITAL ELECTRONICS

Digital Principles: Number system, binary arithmetic, Basic gates and universal gate operations. Boolean algebraic theorems and properties-Karnaugh map: two and four variable map, POS and SOP simplification, NAND and NOR implementation, don't care condition, Logic families: characteristics and parameters. TTL gates, TTL open collector gates, CMOS gates, TTL-CMOS interface. Combinational logic design: parity checker, half and full adders, demultiplexer, multiplexer, decoders, encoders, PAL.

A/D, D/A Converters: Principle of variable network and binary ladder type: four bit D/A converter, A/D converter, counter method and successive approximation, resolution and accuracy of D/A and A/D converter; frequency counters and digital voltmeters.

UNIT XII: NUMERICAL METHODS AND COMPUTATIONAL PHYSICS

Numerical Methods: Introduction-Straight line fitting (group average and least square methods)-fitting a parabola (least square methods) – successive approximation method - condition for the convergence- order of convergence – Regula – Falsi method – Newton Rapson method-criterion for the convergence – order of convergence – Elimination method-Gauss – Jordan method

Numerical Differentiation: Numerical Differentiation forward and backward-Integration: - Trapezoidal – Interpolation – Lagrangian - unequal-Newton's forward interpolation formula (equal intervals) - Matrix: Solving the simultaneous equations – eigen value of a matrix by power methods.

COMPUTER & FORTRAN: Computers: Introduction input & output devices-CPU, Applications languages & packages (outline only). Fortran: Constants, variables, operators – mode of expressions arithmetic to FORTRAN expression – Hierarchy of operators, Statements – conditional and unconditional - i/p & o/p Statements – executable Statements-format and go to Statements – computed goto – arithmetic IF logical IF, Built- in-functions, Do statement - simple Do loop-function subprogram Subroutine subprogram (Introduction)

UNIT XIII: NUCLEAR PHYSICS

General Properties of Nuclei: Constituents of nucleus and their Intrinsic properties, quantitative facts about size, mass, charge density (matter energy), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/Z plot, angular momentum, parity, magnetic moment, electric moments, nuclear excites states.

Nuclear Models: Liquid drop model approach, semi empirical mass formula and significance of various terms, condition of nuclear stability. Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.

Nuclear Instrumentation: Cyclotron-Synchro cyclotron- Proton Synchroton-Detectors-GM Counter-Scintillation counter-Bubble Chamber-Nuclear Reactors -- Neutron Cross section-Fission Product- Energy release- Chain Reaction- Multiplication factor- Moderator-Natural Uranium-Diffusion equation.

Radioactivity decay:(a) Alpha decay: basics of α-decay processes, theory of α- emission, Gamow factor, Geiger Nuttall law, α-decay spectroscopy. (b) β-decay: energy kinematics for β-decay, positron emission, electron capture, neutrino hypothesis. (c) Gamma decay: Gamma rays emission & kinematics, internal conversion. Nuclear Reactions: Types of Reactions. Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct reaction, resonance reaction, Coulomb scattering (Rutherford scattering).

Particle physics: Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons.

UNIT XIV: ASTROPHYSICS

Radio interferometry: Radio galaxies- characteristics and classification- Radio interferometry quasars radio and optical properties of quasars - redshift of quarters. Basics of orbiting telescope, Hubble space telescope, Focault's experiment, Van-Allenbelts, Aurora.

Astronomical Objects: Red giants, Heavy element synthesis, white dwarfs - Chandrasekar's mass limit, rotating black holes, Shwarzchild radius. Tidal and Planetesimal theories - Kupier'sproto- planet theory, Hertzsprung - Russel diagram applications, outline of Saha's ionization theory.

Solar system: Structure of photosphere, chromosphere, corona and their characteristics – Mechanism of energy production in the Sun, Solar prominences, spicules and plages. Steady state theory, evidence in favour of Big – bang theory- Future of the Universe, pulsating theory standard model, inflation.

UNIT XV: COMMUNICATION ELECTRONICS

Modulation: Amplitude modulation, modulation index, side bands, power output, Base modulation, Detection: Diode and transistor detectors, super – heterodyne receivers.
Frequency modulation: theory, sidebands, qualitative discussion of Bessel harmonics bandwidth, modulation percentage, direct FM transmitter,-FM detectors, slope detectors, discriminator, ratio detector.

Image Transmission: Image transmission principles, scanning, synchronization & blanking

pulse; composite signal; TV camera: Image orthicon; B/W TV transmitter & receiver (block diagram); NTSC & PAL systems; transmission of colour information; colour TV transmitter & reviver (block diagram);colour picture tube-shadow mask tube; TV channels & their frequencies; cable TV (elementary ideas).

Wave Propagation in Space: Ground waves propagation, line of sight distance, reflection of radio waves by earth's surface. Space wave propagation, effect of earth's curvature, duct propagation; sky waves, theory of Ionospheric refractive index and bending of sky waves, expression for skip-distance & maximum usable frequency; ionospheric anomalies.

UNIT XVI: MATERIAL SCIENCE

Types of Mateials – metals – insulating materials oraganic materials – semiconductors – magnetic materials – superconducting materials – composites – nanomaterials.

Preparation and characterization: Different techniques of growing crystals from melts from solution and growth of thin films – characterization of by X ray and optical methods

Properties of materials: Electrical properties of metals and semiconductors, thin films conductivity, resistivity, temperature dependent properties. Conduction of n type and p type semiconductors. Conduction in metallic and insulator films – thermal and optical properties of materials.

Mechanical properties of metals – elastic deformation of metals – fracture of metals plastic deformation of metals – slip direction, critical shear stress – interference of lattice defects on mechanical properties.

Applications: Applications of materials – interference filters – gas sensors – Thermisters – resistors – capacitors – solar cells. Non destructive testing ultrasonic, magnetic and optical testing.

UNIT XVII: MEDICAL PHYSICS

Physics of the Body-I

Basic Anatomical Terminology: Standard Anatomical Position, Planes. Familiarity with terms like- Superior, Inferior, Anterior, Posterior, Medial, Lateral, Proximal and Distal. Mechanics of the body: Skeleton, forces, and body stability. Muscles and dynamics of body movement. Physics of Locomotors Systems: joints and movements, Stability and Equilibrium. Energy household of the body: Energy balance in the body, Energy consumption of the body, Heat losses of the body, Thermal Regulation. Pressure system of body: Physics of breathing. Physics of cardiovascular system.

Physics of the Body-II

Acoustics of the body: Nature and characteristics of sound, Production of speech, Physics of the ear, Diagnostics with sound and ultrasound. Optical system of the body: Physics of the eye. Electrical system of the body: Physics of the nervous system, Electrical signals and information transfer.

Physics of Diagnostic and Therapeutic Systems-I

X-RAYS: Electromagnetic spectrum, production of x-rays, x-ray spectra, Brehmsstrahlung, Characteristic x-ray. **X-ray tubes & types**: Coolidge tube, x-ray tube design, tube cooling stationary mode, Rotating anode x-ray tube, Tube rating, quality and intensity of x-ray. X-ray generator circuits, half wave and full wave rectification, filament circuit, kilo voltage circuit, types of X-Ray Generator, high frequency generator, exposure timers and switches, HT cables, HT generation.

Radiation Physics: Radiation units exposure, absorbed dose, units: rad, gray, relative biological effectiveness, effective dose, inverse square law. Interaction of radiation with matter Compton & photoelectric effect, Rem & Sievert, linear attenuation coefficient. **Radiation Detectors**: Thimble chamber, condenser chambers, Geiger Muller counter, Scintillation counters and Solid State detectors, ionization chamber, Dosimeters, survey methods, area monitors, TLD, Semiconductor detectors.

Atomic Structure

Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.

ELEMENTARY QUANTUM MECHANICS

Black body radiation; Plank's radiation law; photoelectric effect; Compton effect; De Broglie hypothesis; Heisenberg's uncertainity principle; Sinusoidal wave equation; Radial and angular wave functions; Probability distribution curves; Hamiltonian operator; Schrodinger wave equation and its significance; physical interpretation of wave function; postulates of quantum mechanics; particle in one dimensional box. **Quantum mechanics:** Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2, Schrödinger equation for hydrogen atom. Radial and angular parts of the hydronic wave functions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum quantum numbers m_l and m_s. Shapes of s, p and d atomic orbitals, nodal planes. Spin quantum number (s) and magnetic spin quantum number (ms).

Periodic classification and propertiers

Periodic properties – Atomic radius – ionic radius, ionization potential, electron affinity and electronegativity – Their significance in chemical bonding.

Chemical Bonding and Molecular Structure

Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, Lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character. Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with the following examples – $BeCl_2$, BF_3, NH_3, SF_4, PCl_5, SF_6. Concept of resonance and resonating structures in various inorganic compounds. MO Approach: Rules for the LCAO method, bonding and anti-bonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, MO treatment of homonuclear diatomic molecules of O_2 and N_2 and heteronuclear diatomic molecules such as CO, NO and NO^+. Comparison of VB and MO approaches.

Hydrogen, Hydrides, and S-block elements

Hydrogen-Isotopes, ortho- and para-hydrogens. Hydrides: ionic, covalent, metallic and interstitial hydrides, Hydrogen bonding.

Alkali metals: Introduction, halides, oxides and hydroxides, salts of oxo-acids, aqueous solution chemistry, complexes and organometallic compounds.

Alkaline Earth metals: Introduction, halides, oxides and hydroxides, salts of oxo-acids, aqueous solution chemistry, complexes and organometallic compounds.

SOLID STATE

(a) Definition of Space lattice , Unit cell , Laws of crystallography –

(i) Law of constancy of interfacial angles

(ii) Law of rationality of indices

(iii) Law of symmetry, symmetry elements in crystals

(b) X-ray diffraction by crystals -- Derivation of Bragg's equation. Determination of structures of NaCl, CsCl, KCl, (Laue's method and powder method).

Gaseous State:

Kinetic molecular model of a gas: Postulates and derivation of the kinetic gas equation - collision frequency - collision diameter - mean free path and viscosity of gases, including their temperature and pressure dependence, relation between mean free path and coefficient of viscosity, calculation of σ from η; variation of viscosity with temperature and pressure. Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degree of freedom and molecular basis of heat capacities.

Behaviour of real gases: Deviations from ideal gas behaviour, compressibility factor, Z and its variation with pressure and temperature for different gases. Causes of deviation from ideal behaviour. van der Waals equation of state, its derivation and application in explaining real gas behaviour, calculation of Boyle temperature. Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states, critical state, relation between critical constants and van der Waals constants, law of corresponding states.

DILUTE SOLUTIONS AND COLLIGATIVE PROPERTIES

Method of expressing concentrations of solutions; dilute solutions; colligative properties; Raoult's law; relative lowering of vapour pressure; Molecular weight determination; Law of osmatic pressure; determination molecular weight by osmatic pressure; elevation of boiling point and depression of freezing point; thermodynamic derivation of the relation between molecular weight and elevation of boiling point and the relation between molecular weight and depression of freezing point.

PHASE EQUILIBRIUM

Definition of Phase, Component and Degrees of Freedom; Derivation of Gibb's phase rule; Phase equilibria of one component systems – H_2O, CO_2 and sulphur systems; Two component systems – Solid-Liquid equilibria- simple eutectic Bi-Cd and Pb-Ag systems; desilverisation of lead; Solid solutions-compound formation with congruent melting point (Mg-Zn) and incongruent melting point ($NaCl$-H_2O and $CuSO_4$-H_2O) systems. Liquid-liquid mixtures-ideal liquid mixtures; Raoult's and Hendry's law; non-ideal solutions; partially miscible liquids-phenol-water; trimethylamine-water and nicotin-water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature. Azeotropes-HCl-H_2O and ethanol-water systems.

Nernst distribution law-thermodynamic derivations and applications.

Review of thermodynamics and the Laws of Thermodynamics.

Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature Kirchhoff's equation. Third law of thermodynamics: Statement of third law; concept of residual entropy; Nernst heat theorem; Evaluation of absolute entropy from heat capacity data.

Chemical Equilibrium & Ionic Equilibria:

Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between ΔG and ΔG°, Le Chatelier's principle. Relationships between Kp, Kc and Kx for reactions involving ideal gases. Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

CHEMICAL KINETICS

Rate and specific reaction rate; Factors influencing the rate of reaction-concentration, temperature, pressure, catalyst, solvent and light; Order and Molecularity of reactions; Derivation of rate constants-zero, first and second order (with equal and unequal concentrations) reactions; Half-life period; Pseudo order reactions; Determination of order of reactions-differential method, method of integration and method of half-life period.

Effect of temperature on reaction rate; Arrhenius equation; Activation energy and its significance; Theory of reactions-Collision theory and Transition state theory.

CATALYSIS, ADSORPTION AND PHOTOCHEMISTRY

(a) CATALYSIS

Catalyst and catalysis: Homogeneous and heterogeneous catalysis with examples; Acid-base catalysis with examples; Enzyme catalysis-general characteristics; Auto catalysis; Derivation of Michaelis-Menten constant. Theories of catalysis-intermediate compound formation theory and adsorption theory.

(b) ADSORPTION

Adsorption-physisorption and chemisorptions; Factors influencing adsorption; Adsorption Isotherms-Freundlich, Langmuir and BET theories. Application of adsorptions.

(c) PHOTOCHEMISTRY

Difference between thermal and photochemical reactions; Laws of photochemistry-Grothus- Drapper and Stark-Einstein laws; Jablonski diagram; qualitative description of fluorescence and phosphorescence; Non-radiative processes –internal conversion and inter system crossing; Quantum yield.

PRINCIPLES OF QUALITATIVE INORGANIC ANALYSIS

(a)Principles of solubility – solubility product factors affecting solubility temperature, solvent, common ion effect, effect of complex formation Separation of metal ions based on solubility differences – sulphide separations. Applications of solubility product principle in qualitative and quantitative analysis.Standard semi micro procedure of identifying common anions and cations in a mixture containing two salts. Spot tests for common cations. Interfering radicals – reason for their interference and method of their removal. (b)Techniques of separation and purification of mixtures -gravity and suction filtration – centrifugation- drying techniques-melting point and boiling point determinations.

ACIDS, BASES & NON-AQUEOUS SOLVENTS

(a) Acids and Bases-Bronsted acids and bases: Lewis acids and bases: definitions, strengths, representative Lewis acids, heterogeneous acid-base reactions.
Hard & soft acids & bases (HSAB) : Classification, Pearson's HSAB concept, acid basestrength & hardness and softness.

(b) Physical properties of a solvent, Types of solvents and their general characteristics. Reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2, THF and Dioxan.

(c) ELECTROCHEMISTRY-I

(d) Electrical transport-conduction in metals and in electrolyte solutions; specific conductance; equivalent conductance; measurement of equivalent conductance; variation of equivalent conductance with dilution; migration of ions and Kohlrausch law; Ostwald dilution law-uses and limiatations; Debye-Huckel-Onsager equation for strong electrolytes (derivation not required).
(e) Transport number; determination by Hittorf method and moving boundary method; determination of degree of dissociation; determination of K_a of acids; determination of solubility product of sparingly soluble salts; conductometric titrations.

(f) ELECTROCHEMISTRY-II

(g) Types of reversible electrodes- Gas-metal ion, metal-metal ion, metal-insoluble salt and redox electrodes. Electrode reactions; Nernst equation; derivation of cell E.M.F and single electrode potential; sign conventions; electrochemical series and its significance.
(h) Reversible and irreversible cells; conventional representation of electrochemical cells; E.M.F of cell and its measurements; computation of cell E.M.F.; calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and ΔK); concentration cells with and without transport; liquid junction potential; applications of concentration cells.
(i) Definition of pH and pK_a; determination of pH by using hydrogen, quinhydrone and glass electrodes by potentiometric method; potentiometric titrations.
(j) Buffers; mechanism of buffer action; Hendersen-Hazel equation; hydrolysis of salts.

Hydrogen, Hydrides, and S-block elements

Hydrogen-Isotopes, ortho- and para-hydrogens. Hydrides: ionic, covalent, metallic and interstitial hydrides, Hydrogen bonding.
Alkali metals: Introduction, halides, oxides and hydroxides, salts of oxo-acids, aqueous solution chemistry, complexes and organometallic compounds.
Alkaline Earth metals: Introduction, halides, oxides and hydroxides, salts of oxo-acids, aqueous solution chemistry, complexes and organometallic compounds.

P-BLOCK ELEMENTS

General characteristics of Boron group elements - Diagonal relationship between B and Si. Hydrides of Boron – preparation, properties and structure of Diborane. Boron Nitride, Borazine, Sodium Borohydride and Lithium Aluminium hydride,Boric acid

(a) General characteristics of carbon group elements – Allotropy of carbon, structure of Diamond and Graphite, catenation, fullerenes. Fluorochlorocarbons, silicates and carbides.

c) General characteristics of Nitrogen group elements. Allotropy of phosphorus, oxides (N_2O,NO_2, N_2O_3,N_2O_5,P_2O_3,P_2O_5) and Acids of Nitrogen (HNO_2,HNO_3) & Phosphorus (H_3PO_3,H_3PO_4,$H_4P_2O_7$). Preparation and Structure and uses of Hydrazine, Hydrazoic acid and Hydroxylamine. General characteristics of Oxygen group. Allotropy of sulphur - oxides, halides, oxyhalides of sulphur.Oxyacids (H_2SO_4,H_2SO_3,$H_2S_2O_7$) of sulphur.Persulphuric acids, Dithionic and Thiosulphuricacid (structure, preparation and properties). General characteristics of halogen group elements, Oxides and oxoacids of halogens, Relative strength of oxo acids of the halogens, inter halogen compounds, Pseudo halogens, Electro positive character of iodine. Chemistry of noble gases:- Position in the periodic table. Occurrence- isolation and separation of noble gases from atmosphere. Physical properties of noble gases, flurides- oxyflurides and oxides of xenon (preparation, properties and structure). Applications of noble gases.

D and F block elements- general characteristics- metallurgical process-elingham diagram-selection of reducing agents.- colour of the complexes- magnetic properties- applications.

Co-ordination chemistry

Co-ordination chemistry – Methods of preparation of complexes – isomerism in complexes – applications of complex formation in analytical chemistry werners theory-VBT, CFT, MO theory of complexes and their stability chelate effect Stability constants – Their determination – complexes of Metals in different oxidation states and their stability.

NUCLEAR CHEMISTRY

Nuclear forces- atomic mass unit- packing fraction – mass defect and binding energy of the nucleus. Stability of nuclei. Nuclear models- the liquid drop model. Nuclear reactions- nuclear fission- fission of uranium- nuclear reactors- types- importance of thorium in India's nuclear energy production. Nuclear fusion. Radio activity- natural radio activity- rate of radio activity disintegration – half life period- transmutation of elements- group displacement law- radio active decay series. Isotopes-separation of isotopes - applications of isotopes in analytical chemistry, medicine, and in reaction mechanism.Carbon dating.Neutron activation analysis.

Fundamentals of Organic Chemistry

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals.

Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.

Introduction to types of organic reactions: Addition, Elimination and Substitution reactions.

Stereochemistry

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (up to two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; cis - trans nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

Aliphatic Hydrocarbons

Alkanes: Preparation Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. *Reactions:* Free radical Substitution: Halogenation.

Cycloalkanes: Preparation by Dieckman condensation & Baeyer's strain theory. Conformational analysis of mono- and di-substituted cyclohexanes.

Alkenes: Preparation – Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); *cis*-alkenes (Partial catalytic hydrogenation) and *trans*-alkenes (Birch reduction). *Reactions: cis*-addition (alkaline $KMnO_4$) and *trans*-addition (bromine), addition of HX (Markownikoff's and anti- Markownikoff's addition), hydration, ozonolysis, oxymecuration-demercuration, hydroboration-oxidation.

Alkynes: Preparation of acetylene from CaC_2 and conversion into higher alkynes by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.

Reactions: Formation of metal acetylides, addition of bromine and alkaline $KMnO_4$, ozonolysis and oxidation with hot alkaline $KMnO_4$.

Aromatic Hydrocarbons

Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid.

Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (up to 4 carbons on benzene). Side chain oxidation of alkyl benzenes (up to 4 carbons on benzene).

Activating and deactivating substituents. Orientation and ortho-para ratio. Addition reactions of benzene - Birch reduction.

Alkyl and Aryl Halides

Alkyl halides:Preparation from alkenes and alcohols. Reactions - hydrolysis, nitrite & nitro formation, nitrile and isonitrile formation, Williamson's synthesis, Elimination *vs* Substitution

Aryl halides:Preparation of chloro-, bromo- and iodo-benzenes from phenol, Sandmeyer and Gattermann reactions. Reactions of aryl halides: Aromatic nucleophilic substitution (replacement by –OH group and effect of nitro substituent. Benzyne mechanism: $K(Na)NH_2/NH_3$.

Reactivity and relative strength of Carbon-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

Alcohols and Phenols

Alcohols:Preparation of primary, secondary and tertiary alcohols using Grignard reagent, ester hydrolysis, reduction of aldehydes, ketones, carboxylic acids and esters. Reactions with sodium, HX (Lucas Test), esterification, oxidation (with PCC, alk. $KMnO_4$, acidic dichromate, Con. HNO_3). Oxidation of diols - Pinacol-Pinacolone rearrangement.

Phenols: Preparation bycumene hydroperoxide method, from diazonium salts. Reactions - Electophilic substitution - nitration, halogenations and sulphonation. Reier-Tiemann reaction, Gattermann-Koch reaction, Houben- Hoesch condensation, Schotten Baumann reaction. Acidic character of phenol, comparative strength of alcohol and phenol.

Carbonyl Compounds

Structural significance of the carbonyl function and nomenclature.

Aldehydes and ketones:Formaldehye, acetaldehyde, acetone and benzaldehyde - preparation from acid chlorides & from nitriles. Reactions: reaction with HCN, ROH, $NaHSO_3$, amino derivatives. Iodoform test, aldol condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation, Clemmensen Reduction and Wolff Kishner reduction. Meerwein- Pondorff-Verley reduction.

***Carboxylic acids & their derivatives*:** Preparation of formic, acetic and benzoic acids. Reactions: Hell-Volhardt-Zelinsky reaction, synthetic applications of diethyl malonate &ethyl acetoacetate. Preparation of acid chlorides, anhydrides, esters and amides from acids and their interconversion. Reactions: comparative study of the nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation.

Organic Compounds of Nitrogen

Nitro compounds:Preparation of nitroalkanes and nitroarenes. Reduction of nitrobenzene under various conditions, nitro-acinitro tautomerism.

Amines (aliphatic and aromatic):Classification, preparation from alkyl halides, Gabriel-Phthalimide synthesis, Hofmann bromamide reaction. Hofmann and Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO_2, Schotten-Baumann reaction, Electophilic substitution in aniline: nitration, bromination and sulphonation.

Diazonium salts: Preparation from aromatic amines. Conversion to benzene, phenol and azodyes.

Heterocyclics

Molecular Orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with emphasis on the mechanism of electrophilic substitution reaction, mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five- and six-membered heterocyclics. Preparation and reaction of indole, quinoline and isoquinoline with special reference to Bisler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Biological Chemistry-I:

Elementary treatment of digestion and absorption of carbohydrates, proteins and fats:

Carbohydrates: Biological importance of carbohydrates, Metabolism, Cellular currency of energy (ATP), Glycolysis, Alcoholic and Lactic acid fermentations, Krebs cycle.

Proteins: Aminoacids, peptides and proteins: classification of proteins: Digestion and absorption of proteins, Formation of Urea, Transamination, Deamination, Plasma Protein, Lipotropic factors.

Lipids: Definition, Classification, Importance, General Lipid Metabolism, Digestion and Absorption of Fat, Oxidation of Fatty acids, Ketosis, Lipoprotein metabolism classification of lipoprotein, Biological importance of triglycerides and phosphoglycerides and cholesterol. Polymers- classification-preparation –uses of polymers. Structure and functions of biopolymer such as proteins and Nucleic acids – Primary, Secondary and tertiary structures of proteins Mechanism of Enzyme action – DNA and RNA.

Biological Chemistry-II:

Enzymes: Elementary treatment of enzymes, cofactors, prosthetic groups and theory of enzyme action. Nomenclature, classification, effect of pH, temperature on enzyme activity, enzyme inhibition.

Hormones: Introduction, General Mechanism of actions - Physiological functions of adrenaline, thyroxin, oxytocin, insulin and sex harmones. Micronutrients and their biological role in human systems. Iron Metabolism - General consideration of Importance of sodium, potassium, calcium, magnesium, chloride and fluoride - Vitamins: General consideration, clinical importance.
Definition of Health, WHO standard - Balanced diet.

Biochemical Analysis: Principle of estimation and diagnostic approach by blood and urine analysis:
Blood: Composition, grouping and Rh factor - collection and preservation of samples. Anaemia, Regulation, estimation and interpretation of data for blood sugar, urea, creatinine, cholesterol and bilirubin. significance of HDL and LDL - Important lipid profile tests.
Urine: Collection and preservation of samples, Formation of urine, Composition and estimation of constituents of normal and pathological urine.
Normal and abnormal values of clinical chemistry in relation to human diseases – General consideration and interpretations.

Computer in chemistry

Introduction: Basic computer organization, processor and memory – main memory, secondary storage devices and storage hierarchy. Software – relationship between hardware and software types of software. Planning the computer program – algorithm and flowcharts. Basics of operating systems.

Computer languages – machine language, assembly language, assembler, compiler, interpreter and programming languages - C language – introduction, C compiler, operating systems and preprocessor directives - variables, constants, operators, input and output functions.

Control structures – conditional, looping, goto, break, switch and continue statements, functions, arrays and pointers.

Applications in Chemistry-I calculation of the radius of the first Bohr orbit for an electron, calculation of half-life time for an integral order reaction, calculation of molarity, molality and normality of a solution, calculation of pressure of ideal or Vanderwaal's gas, Calculation of electronegativity of an element using Pauling's relation.

Applications in Chemistry-II - Calculation of empirical formulae of hydro carbon, calculation of reduced mass of a few diatomic molecules, determination of the wave numbers of spectral lines of hydrogen atom, calculation of work of expansion in adiabatic process, calculation of pH, solubility product and bond energy using Born - Lande equation, calculation of standard deviation and correlation coefficient.

BASIC ANALYTICAL CHEMISTRY

(A) Laboratory Glassware:

a) Types, maintenance and cleaning.
b) Calibration of burette, pipette and standard flask; practice of inter-calibration.
c) Laboratory first aids.

(B) Stoichiometry and concentration systems:

Stoichiometry – Mole and equivalent concepts – Stoichiometric calculations - concentration systems – Molarity – Normality – p-functions – percent concentration – ppm and ppb - calculations involving various types of concentration systems.

Principles of Titrimetric (Volumetric) Analysis:

(a) Definition of the terms primary standard and secondary standard solutions — Equivalence point and end point of titrations, — Types of titrations — Calculations involving volumetric titrations.

(b) Acid - Base Titrations : Derivation of titration curves for strong acid Vs strong base and weak acid Vs strong base titrations — Theory of acid-base indicators.

(c) Redox Titrations : Nernst equation — Theory of redox indicators — Types of redox indicators.

(d) Complex Formation Titrations: Chelating agents – EDTA- Theory of metallochyromic indicators – Titrations involing EDTA – Types of EDTA titrations.

(e) Precipitation Titrations: Argentometric titrations – indicators for titrations involving silver nitrate.

Statistical Evaluation of Analytical Data :

Mean, median and mode – Accuracy and precision – ways of expressing accuracy and precision and their calculation – Errors – types – determinate, indeterminate and gross errors minimization of errors – methods of reporting data – significant figures and problems involving significant figures – Statistical treatment of indeterminate errors – confidence limits – criteria for rejection of outliers Q-test graphing – the least squares principle – linear regression of data

CHEMICAL TECHNOLOGY & SOCIETY

Chemical Technology:

Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid-liquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry. Introduction to clean technology. Chemistry in Nanotechnology Breakthroughs, Chemistry in Computing, Chemistry in Transportation, and Chemistry in the Space Age. Policies to Enable Innovations in Technology – updating primary chemicals management law to adapt to scientific advancements and to promote that "chemical products are safe for intended use", while also encouraging innovation.

Society:

Exploration of societal and technological issues from a chemical perspective. Chemical and scientific literacy as a means to better understand topics like air and water (and the trace materials found in them that are referred to as pollutants); energy from natural sources (i.e. solar and renewable forms), from fossil fuels and from nuclear fission; materials like plastics and polymers and their natural analogues, proteins and nucleic acids, and molecular reactivity and interconversions from simple examples like combustion to complex instances like genetic engineering and the manufacture of drugs. The innovative products of chemistry lead to cutting edge advancements - applied technology in medical devices, aerospace, computing, cars, fuels etc. - technological advancements that drive innovation, create jobs and enhance safety in our everyday lives. Communicating costs and benefits of the chemical industry and chemical technology to society – Risk communication.

MOLECULAR SPECTROSCOPY-I

(a) MICROWAVE SPECTROSCOPY

Electromagnetic radiation; Regions of the spectrum; Diatomic molecules; selection rules; energy levels of rigid rotor (semi-classical principles); spectral intensity; distribution using population distribution (Maxwell-Boltzmann distribution); determination of bond length; isotope effect.

(b) INFRARED SPECTROSCOPY

Infrared spectrum; selection rules; energy levels of simple harmonic oscillator; pure vibrational spectrum; intensity; force constant and its determination; qualitative relation between force constant and bond energy; effect of anharmonic motion and isotope on the infrared frequency; vibrational frequencies of different functional groups.

MOLECULAR SPECTROSCOPY-II

RAMAN SPECTROSCOPY

Concept of polarisability; selection rules; pure rotational and pure vibrational Raman spectra of diatomic molecules; classical theory of rotational and vibrational Raman spectroscopy, complementarities of Raman and IR spectroscopy, mutual exclusion principle, polarized and depolarized Raman lines.

(a) ELECTRONIC SPECTROSCOPY

Concept of potential energy curves for bonding and antibonding molecular orbitals; qualitative description of selection rules; Frank-Condon principle; predissociation; qualitative description of σ, π and n molecular orbitals and their energy levels; types of electronic transitions.

(b) PHYSICAL PROPERTIES AND MOLECULAR STRUCTURE

Optical activity and polarization (Clausius-Mossotti equation); dipole moment; induced dipole moment; measurement of dipole moment – temperature and refractivity methods;dipole moment and structure of molecules. Magnetic properties-paramagnetism, diamagnetism and ferromagnetism

CHEMOINFORMATICS

Introduction to Chemo informatics: History and evolution of chemoinformatics, Use of chemoinformatics, Prospects of chemoinformatics, Molecular Modelling and Structure elucidation.

Botany

Thallophytes, Microbes and Plant Pathology

Algae-Fungi-Lichens and Mycorrhiza-Bacteria and Viruses-Plant Pathology

Amphibians of Plant Kingdom-Pteridophytes-Gymnosperms-Paleobotany

Fossil Botany-Introduction to Cell Science-Tissues and Organs-Secondary Growth-Organization of Flower and Pollination-Fertilization, Embryo and Endosperm

Field Botany (Ecology and Angiosperm Taxonomy)

Introduction and Ecological factors-Plant communities and Ecosystem-Angiosperm Taxonomy-Introduction and Identification-Angiosperm Classification and Polypetalae Families-Gamopetalae, Monochlamydeae and Monocot Families

(Bacteria, Algae, Fungi, Archegoniatae, Angiosperms and Economic Botany)

Monerans-Algae and Fungi-Archegoniatae--Angiosperms-Economic Botany -Introduction to flower, fruit and seeds. Study of Angiospermic families: Annonaceae, Asclepiadaceae, Nyctaginaceae and Poaceae.

(Cytology, Anatomy, Physiology, Microbiology and Plant Ecology)

Cell and Organelles-Plant Anatomy-Plant Physiology-Microbiology-Plant Ecology

Medicinal Botany

Introduction-Raw materials for Drugs from Plants I- Glycosides - Raw materials for Drugs from Plants II - Tannins -Fixed oils - Volatile oils -Resins -Alkaloids Steroids- Plant Toxins-Antibiotics

Economic Botany

Origin of Crop Plants-Cereals-Pulses-Vegetables- Fibre Plants-Timber Plants-Oil Plants- Spices and Condiments

External Morphology of Angiosperms

History of Plant identification and Root Morphology-Stem Morphology-Leaf Morphology- Inflorescence and Flower Morphology-Fruit and Seed Morphology

Herbal Botany

Introduction to Herbal Medicines-Pharmacognosy and Medicinal uses of Herbs-Pharmacognosy-Phytochemistry of medicinal herbs-Common medicinal formulations

Genetics

Heredity-Linkage and Crossing over-Fine structure of genes and Chromosome-Mutations and Chromosomal Aberrations-Extra-chromosomal inheritance and Applied Genetics

Horticulture and Plant Breeding

Landscaping and Gardening-Orchard and Kitchen Gardening-Plant Reproduction-Methods of Crop Improvement-Inbreeding depression and Heterosis

Molecular Biology

The Genetic Material-Replication and Transcription of DNA-Protein synthesis-Gene Regulation Gene Mutation- Polymerase Chain reaction

Plant Physiology and Biochemistry

Plant-water relations and Mineral Nutrition-Carbohydrates and Lipids- Photosynthesis and Translocation of solutes-Amino acids, Proteins and Enzymes-Environmental Plant Physiology

Plant Biotechnology

Plant Tissue Culture, Design of Lab and Media-Types of Tissue Cultures- I and Secondary metabolites-Types of Tissue Cultures- II-Genetic Engineering and Cloning Vectors-Transgenic Plants, Bioethics and Bio safety

Mushroom Culture

History of Mushroom Culture-Infrastructure and Inputs-Stages in Mushroom Production-Harvest and Storage-Mushroom Recipes

Biofertilizers and Organic Farming

Manures and Bio fertilizers-Bacterial Bio fertilizers-Algal Biofertilizers-Fungal Biofertilizers-Organic Farming

Biostatistics and Computer Applications in Biology

Biostatistics-I-Biotstatistics-II-Basics of Computer-Softwares used in Biology-Computer Applications in Biology

Horticulture

Landscaping and Gardening-Orchard and Kitchen Garden Layout-Nursery and Canopy Management-Cropping Systems- Disease Control and Pest Management

Plant Tissue Culture

Introduction and History-Culture Media-Sterilization Procedures-*In Vitro* Cultures- Applications of PTC

Ethnobotany

Ethnobotany-Methodology of Ethnobotanical Studies-Role of Ethnobotany in Modern Medicine Conservation of Plant Genetic Resources- Ethnobotany and Legal Aspects

Intellectual Property Rights

Introduction and Patents-Copyrights, Trademarks and Geographical Indications-Protection of Traditional Knowledge and Industrial Designs-Protection of Plant Varieties-Biotechnology and Intellectual Property Rights

Greenhouse Technology

Fundamentals of Greenhouse Technology-Fertilizer Application-Water in the Greenhouses-Plant Protection in Greenhouses-Applications of Greenhouse Technology

SUBJECT: ZOOLOGY

BIODIVERSITY OF INVERTEBRATES AND CHORDATES

Classification- Binomial Nomenclature - Invertebrata and Chordates - structure and life history of pathogenic protozoans - Entamoeba histolytica - plasmodium – Trypanosome- Leishmania- Structure and life history of helminth parasite - Taenia solium - Fasciola hepatica- schizostoma- Ascaris lumbricoides- Structure and life history of Amphioxus- Balanoglossus - Ascidian and their evolutionary significance, vertebrate comparative anatomy. Integument, Brain, Heart and Urinogenital organs. Economically important vertebrates and vertebrate Pests.Fishery resources of India- Energy metabolism of carbohydrates, lipids, proteins and nucleic acids. Oxidative phosphorylation. Role of major and minor elements in metabolism. Enzymes – classification of enzymes, Coenzymes and cofactors. Mechanism of action of enzymes. Bio-energetics and thermodynamics - intermediary metabolism.

BIO-STATISTICS AND BIOINFORMATICS

Collection of data - Measures of Central tendency - Bioinformatics resources - Tools of bioinformatics - Databases - Human Genome Project.

Microbiology : Agricultural Microbiology - Food microbiology - Microbes of environment - Control of microbes - Animals and human welfare.

Vermitechnology:- Types of earthworm Vermicompost - Natural enemies of earthworm.

vector biology :- Insects as vectors-Apiculture - honey bees. Fish culture aquarium - ornamental fishes – commercial, aesthetic values. Fish breeding and fish diseases.

Cell and Molecular Biology

Prokaryotic and Eukaryotic cells. Ultrastructure, Organisation and functions of cell membrane, Endoplasmic reticulum, Golgi body, lysosome, mitochondrion, Ribosome structure of DNA, A, B, C and Z forms of DNA. Transcription, translation, Gene mutation.

Genetics

Gene interactions, Multiple alleles, Recombination, Linkage, Crossing over, Chromosome mapping. Genes and their expression.

Population genetics Mendelian population. Hardy weinberg law. Animal breeding and Human Genetics – Inbreeding, outbreeding, Heterosis. Genetic engineering and its application in Agriculture. Animal husbandry and medicine. Inborn errors of metabolism. Chromosomal aberrations.

Physiology

Nutrition: - Essential amino acids, vitamins, minerals and trace elements. Digestion, digestive enzymes absorption, assimilation of carbohydrates, Proteins, Lipids. Intermediary metabolism.

Respiration: - Transport of respiratory gases by blood. **Circulation** - Types of heart. **Movement** - Types of muscle cells, Structure of muscle cell, Muscle contraction and its types. **Excretion** - Vertebrate kidney and urine formation. Excretion of nitrogenous products. Renal regulation of acid- base balance.

Sensory physiology: Chemoreception- Mechano reception- Thermo reception- Photoreception. Nervous coordination: Transmission of impulses. Nervous system- Central nervous system- Autonomic nervous system. Memory and learning. **Chemical coordination** - Endocrine glands and hormones. Endocrine interrelations. Neuro Endocrine reflexes. Growth and reproduction. Moulting and metamorphosis in crustations ,insects and vertebrates. Pheromones in reproduction. Physiology of human reproduction. **Developmental biology**- Gametogenesis Fertilization- Parthenogenesis- Cleavage and fate map of frog and chick. Involvement of of genes in developmental process - General Metabolism during gastrulation- Integration of gastrulation. Placentaton in mammals- Human pregnancy. Organogenesis- Heart, Eye, Brain, kidney. Extraembronic membranes. Genetic control, Regeneration, Reproductive Biology Animals and Humans.

Immunology: Antigens and Antibodies- specific and non specific immune system. Immunity- (Innate and Acquired) Antigens- Haptens- Antigenic determinants. Immunoglobulin molecules as antigens- allotypes. Immune system and lymphoid organs. Macrophages -T cell and B cell. Antibody production Immune response- Humoral and cell mediated. Regulation of immune response- antigen antibody reaction- Vaccination- Allergy – AIDS- Congenital immunodeficiency. Health and hygiene. **Environmental biology** -Biotic and abiotic factors of environment. Biogeochemical cycles- Ecosystem concepts. Resource Management -Energy transformation, productivity - food chain- footweb. Pyramids.

Zoogeography of Indian wild animals. Indian primates- Natural resources- Conservation of Natural Resources and Wildlife Protection Act. Wildlife sanctuaries of Tamilnadu. Environment Degradation- Factors affecting environment. **Evolution**- Origin of life- Theories of evolution- Natural selection- Microevolution- Genetic drift- Speciation- Incomplete species- Species problems- Allopatry and Sympatric speciation.

Macro evolution- Geological records- Fossils and Fossilization- Evolutionary trends -Parallel evolution- Progressive and Retrogressive trends- Rates of Evolution. **Man and Biosphere**- Man's role in conservation of natural resources and biosphere. Human activities that modify biosphere. Human Resource Management. Biodiversity and conservation- Animal products- Dairy, Honey, Fishery, Meat and poultry.

BUSINESS MANAGEMENT

i) Introduction: Concept, nature, process, and significance of management: Management roles (Mintzberg) An overview of functional areas of management; Development of management thought; Classical and neo-classical system; Contingency approaches.

ii) Planning: Concept, process, and types, decision making – concept and process; Bounded Rationality; Management by objective; Corporate planning; Environment analysis and diagnosis Strategy formulation.

iii) Organizing Concept, nature, process, and significance; Authority and responsibility relationship - Centralization and decentralization - Departmentation - Organization Structure – forms and contingency factors.

iv) Motivating and Leading People at Work: Motivation-concept; Theories-Maslow, Herzberg, McGregor, and Ouchi; Financial and non-financial incentives. Leadership - concept and leadership styles; leadership theories (Tannenbaum and Schmidt) Likert System Management - Communication – nature, process, networks, and barriers; Effective communication.

v) Management Control: Concept and process; Effective control system; Techniques of Control - traditional and modern.

GOODS AND SERVICES TAX (GST)

i) GST - scope – Benefits – salient features – GST council – Important Terms - Minimal Interface – Input Tax Credit – Refund – Demands – Alternate Dispute Resolution Mechanism.

ii) GST Act – CGST Act SGST Act – IGST Act - UTGST Act- GST (compensation to the State) Act – features and provisions.

iii) GST - Levy & Collection of tax – Time and Value of Supply - Input Tax Credit – Registration – Tax Invoice _ Debt Credit Notes.

iv) Administration – GST Accounts and Records – Returns – Payment of tax - Refunds- Assessment – Audit – Inspection, Search, Seizure and arrest.

v) Demand and recovery – Liability to pay tax – Advance Ruling – Appeals and revisions – offences and penalties.

INCOME TAX

i) **Introduction:** Basic concepts: Income, agricultural income, Person, Assessee, assessment year , previous year, Gross total income, Total Income, Maximum Marginal Rate of Tax; PAN. **Residential Status;** Scope of total income on the basis of residential status, Exempted Income under Section

ii) **Computation of Income under** salary, Income from house Property.

iii) **Computation of Income under** Profits and gains of business or Profession, Capital gains and Income from other Sources.

iv) **Computation of total income and tax liability** Income of other persons including in assessee total income, aggregation of income and set off and carry forward of losses; deduction from gross total income; rebates and reliefs - computation of total income of individual and firms; tax liability of an individual and a firm (5 leading cases decided by the Supreme Court).

v) **Return of Income:** Filing of returns; manually, online filing TDS: provisions and procedures of compulsory

online filing of returns for specified assesses.

FINANCIAL MANAGEMENT

i) Financial Management: Financial goals; Profit vs. Wealth maximization, Financial functions – Investment, financing, and dividend decisions; financial planning.

ii) Cost of Capital: Significance of cost of capital; Calculating cost of debt; Preference share, equity capital and retained earnings; combined (weighted) cost of capital. Operating and Financial Leverage: Their measure; Effects on profit, analyzing alternate financial plans, And combined financial and operating leverage - Capital Structure: Theories and determinants.

iii) Capital Budgeting: Nature of investment decisions - evaluation criteria, pay-back period - accounting rate of return, net present value, internal rate of return - profitability index - NPV and IRR Comparison.

iv) Management of Working Capital: Nature of working capital, significance of working capital, Operation cycle and factors determining working capital requirements - Management of Working capital cash, receivables, and inventories.

v) Dividend Policies: Issues in dividend policies; Welters model; Gordon's model M.M. Hypothesis, forms of dividends and stability in dividends, determinants.

FINANCIAL MARKET OPERATIONS

i) An overview of financial markets in India. Money Market: Indian money markets composition and structure; (a) Acceptance house, (b) Discount house, and (c) Call money market; Recent trends in Indian money market.

ii) Capital Market: Security market – (a) New issue market, (b) Secondary market; Functions and role stock exchange; Listing procedures and legal requirements; Public issue Pricing and Marketing - Stock exchange National Stock Exchange and Over – the – Counter Exchange of India .

iii) Securities Contract and Regulations Act: Main provisions. - Investors Protection: Grievances concerning stock exchange dealing and their removal; Grievance cells in stock exchanges; SEBI; Company Law Board; Press; Remedy through courts.

iv) Functionaries of Stock Exchange: Brokers, sub brokers, market, jobbers, portfolio consultants, institutional investors, and NRIs.

v) Financial Services: Merchant Banking – Functions and roles; SEBI guidelines; Credit rating - Concept, functions, and types.

PRINCIPLES OF MARKETING

i) Nature and Scope of Marketing: Importance of Marketing as a business functions in the economy; Marketing concepts - traditional and modern; selling vs. marketing - Marketing mix; Marketing environment. - Market Segmentation; Consumer Behavior: Nature, Scope, and significance of consumer Behavior and market segmentations - concept and importance - Bases for market segmentation.

ii) Product: Concept of Product, Consumer, and industrial goods, Product Planning and development – Packaging - role and functions; Brand and trade mark; after sale service; product life cycle concept.

iii) Pricing Importance of price in the marketing mix; Factors affecting price of a products/service; Discounts and rebates.

iv) Distribution Channels and Physical Distribution: Distribution Channels – Concept and Role - type of distribution channels - Factors affecting choice of a distribution channel; Retailer and wholesaler; Physical

distribution of goods Transportation; Warehousing; inventory control - Order Processing.

v) Methods of Promotion: Promotion mix - Advertising media –their relative merits and limitations, Characteristics of an effective advertisement, Personal Selling: selling as a career, characteristics of a successful sales personal- Functions of salesman.

ORGANISATIONAL BEHAVIOUR

i) Organizational Behaviour: Focus and Purpose of Organization – Meaning, Need and Importance of Organization – Classification - Organization Goals, Prospects of Formal Organization Organizational Behaviour (OB) – Nature and Scope – Contributions – OB models - Features of Modern OB model.

ii) Individual Behaviour, Personality, Learning and Attitudes – Personality – Definition – Biological, Cultural, Family, Social and Situational; Factors - Theories of Personality – Meaning of learning Learning Process Learning Theory and OB – Organizational Behaviour Modification – Meaning, steps, Process and practices, Attitudes – Characteristics – Components – Formation – Measurement of Attitude.

iii) Group Behaviour and Group Dynamics: Group Dynamics – Meaning – Types – Groups in an organization Group size and Status – Influences – Emergence of informal Leaders - Role Relationship and Group Behaviour Characteristics – Behaviour Problems Group Behaviour – Characteristics – Behaviour Problems – Group Norms – Cohesiveness Features – Effects – Group thinking – Symptom, Consequences and Remedy - Group Decision Techniques.

iv) Dynamics of Organizational Behavior: Organizational changes and Development - Organizational Change Meaning – Nature of Work – Change – Stability Vs. Change - Proactive Vs. reactive change – Pressure of change changes in managerial personnel – change process – organizational resistance to change – Management of change process.

v) Organizational Development – Definitions – Characteristics - Objectives – Team Building – Survey Feed Back – Four System of Management.

HUMAN RESOURCE MANAGEMENT

i) Human Resource Management – Nature and Scope – Objectives – Nature of people and organizations – Personnel Policies and Principles – Environment of Human Resource Management – Social Systems Human Resource accounting and audit.

ii) Human Resource Planning – Human resource / manpower planning – meaning – process of HR Planning Job analysis – Recruitment and selection – Orientation and Placement – Orientation Programmes.

iii) Employee and Reward Systems – Training of personnel – Job evaluation Job satisfaction – Appraising and rewarding performance – money as means of rewarding – economic incentives systems – Wage incentives – Wage administration – Benefits and services – Profit and production sharing.

iv) Motivation – Human needs – Theories of motivation – Maslows Hierarchy needs – Hertzberg's two factor model - Other theories Behavioral modification – Motivational Patterns - Expectancy model Application of motivation concepts.

v) Leadership, Communication and counseling – Nature of leadership behavior Leadership Style Employee Participation – Nature, Scope, Programmes and benefits of Participation – Employee Communication Process Communication System – Employee counseling and types.

ECONOMICS

1. MICROECONOMICS

Introduction

Nature and scope of micro economics – importance and limitations of micro economics micro statics – micro dynamics – comparative statics – concept of equilibrium – static, dynamic and neutral equilibrium Partial Vs General equilibrium role and limitations of price mechanisms in a free market economy frontiers & microeconomics.

Consumer Behavior

Demand and law of demand – utility analysis and derivation of demand ordinal approach- indifferencecurve consumerequilibrium-price,incomeandsubstitutioneffect(Hicksand Slutskey) derivation of demand curve analysis comparison of cardinal and ordinal analysis – Giffin goods – compensated demand – elasticity of demand: price, income and cross consumers surplus Engelcurve.

Theory of Supply and Production

Supply and law of supply – elasticity of supply – production decision factors of production – production function · law of variable proportion returns to scale economies of scale Iso quant approach and producer's equilibrium – factor substitution – elasticity of factor substitution.

Theory of Cost

What are costs? – production and costs – various measures of cost cost curves and their shapes – the relationship between short run and long run average total cost elasticity of cost.

Theory of Revenue and Equilibrium

What are revenues–average and marginal revenue relation between AR and MR Curves–AR, MR and elasticity importance of revenue curves – interactions of cost and revenues – conditions of equilibrium of afirm.

Market Structure and Equilibrium

Market forms perfect and imperfect forms – equilibrium of a firm under perfect competition, monopoly, monopolistic competition, duopoly and oligopoly importance of time element in price theory – price discrimination and measure of monopoly power · control and regulation of monopoly collusive price leadership – kinked demand curve- taxation and equilibrium of a firm-comparison of various markets

Factor Pricing

Market for the factors of production marginal productivity theory of pricing of factor (distribution theory)–Euler's theorem-linkages among the factors of production–theories of wages – determination · wages and collective bargaining wage differentials – rent Ricardian and modern theories of rent – scarcity rent differential rent and quasi rent interest–classical and Keynesian theories profit innovation, risk and uncertainty theories– the concept of normal profit monopoly profit.

Welfare Economics

What is welfare economics–economic and general welfare problems in measuring welfare– classical welfare economics – Pigovian welfare condition – Pareto's criteria value judgment – concept of a social welfare function-compensation principle –the Kaldor- Hicks criterion.

2.MACRO ECONOMICS

Nature and scope of macro economics

Nature and scope of macroeconomics – meaning and definition of key macroeconomic variables(output,unemployment,inflationetc.)–concepts of national income–methods of measuring national income circular flow of income–issues innational income accounting.

Employment and output in a growing economy

The goal of full employment – frictional and structural unemployment unemploymentand inadequate demand the concept of potential output – factors affecting output – production and employment with economic growth growth of actual and potential output

The Classical System

The classical revolutions–say's law quantity theory of money wages,prices,employment, and production- rigid wages and monetary policy in the classical model.

The Keynesian Model

The problem of unemployment the components of aggregate demand – equilibrium income determination of equilibrium income – changes in equilibrium income – the role of fiscal policy and multiplier – the concept of balanced budget multiplier exports and imports in Keynesian model.

Money, interest and income:

The money supply, money demand and interest rate – the relationship between bond prices and interest rates – the Keynesian theory of money demand and interest rate – the liquidity trap – the implications of increase in money supply.

Microeconomic Foundations

Consumption absolute income hypothesis, relative income hypothesis, life cycle hypothesis, permanent income hypothesis – investment (business fixed investment, residential investment and inventory investment) neo-classical theory of investment – accelerator theory of investment – the Tobin's q theory.

The Closed Economy in the Short Run

The goods market and derivation of ISeurve real influences and Shift in IS schedule–the money market and derivation of LM curve – the shift in LM curve determination of equilibrium in come and interestrates the relative efficacy of fiscal and monetary policy.

The Aggregate Demand and Supply

The derivation of aggregate demand and supply curves – the Keynesian aggregate demand with vertical aggregate supply curve – sources of wage rigidity and unemployment – the flexible price with fixed money wage model – labour supply and money wage – the shift in aggregate supply Keynes vs. Classics.

Output, Inflation and Unemployment

Inflation: concepts and consequences- The Phillips curve the natural rate of unemployment –factors affecting natural rate of unemployment–the adaptive expectation and long-run Phillips curve–the concept of rational expectations–policy in effectiveness debate.

Open Economy Models

The Mundell-Fleming model – determining equilibrium output in a small open economy – the monetary and fiscal policy under flexible and fixed exchange rates regimes – the Mundell-Flemming model with changing price level.

3.PUBLIC FINANCE

Taxation

Theories of taxation– ability and benefit principles of taxation (Lindhal) - Principle of maximum social advantage – taxable capacity – shifting and incidence – types of taxes – characteristics of good tax system.

Public Expenditure

Theories of public expenditure–Wagner'slaw- Peacock hypothesis Samuelson theory of public goods- basics of cost benefit analysis.

Deficit Financing

Deficit financing–monetarist versus Keynesian views pattern of deficit financing public debt management and implication for growth,inflation and interestrate.

Trend and Pattern of Public Revenues

India's public revenue–taxes of union, state and local Governments–trends in tax revenue–tax/GDP tax and distributive justice - direct versus indirect taxes – tax reforms - rate and procedure rationalization – VAT in union and statetaxes.

Trend and Pattern of Public Expenditure

India's public expenditure – trend in union, state and local Government's public expenditure – public expenditure/GDP – change in the composition of public expenditure – developmental versus non developmental – plan versus non plan – revenue versus capital – economicandfunctionalclassificationofpublicexpenditure–implications.

Basics of Budgeting

Constitutional basis for budgeting–process of passing finance and appropriation bills in the parliament/assembly – CAG and PAC – FRBM – deficit, public debt and monetary management.

4. MONETARY ECONOMICS

Definition, Functions and Theories of Money

Money and its function the concepts and definitions of money – measurement of money advantages of money – theories of demand for money: Classical approach. the transactions and cash balance approach, the Keynesian analysis, Post Keynesian developments, Monetarist approach.

Money Supply

Financial intermediaries nature and functions theories of money supply - mechanistic model of money supply determination – high powered money and behavioral model of money supply determination - methods of monetary control – Interest rates in closed and open economies – theories of term structure.

Monetary Transmission Mechanism:

Meaning–interest rate channel, credit channel, bank lending channel, balance sheet channel, exchange rate channel, other asset pricechannels.

Monetary Policy:

Instruments, targets, indicators, lags in monetary policy and rules versus discretion debate.

Central Banking:

Functions of a central bank – quantitative and qualitative methods of credit control – bank rate policy, open market operations, cash reservation, selective methods, role and functions of Reserve Bank of India – objectives and limitations of monetary policy with special reference toIndia.

5. INTERNATIONAL ECONOMICS

Theories of International Trade

Distinguishing features of internal and international trade – the pure theory of international trade-theories of absolute advantage, comparative advantage and opportunity cost – Heckscher-Ohlin theory of trade – factor price equalization theory - empirical relevance of the H-O theory

Alternative trade theories

Vent for surplus approach – Kravis and Linders theory of trade – imitation gap and product cycle theory, role of dynamic factor in explaining the emergence of trade, trade under imperfect competition and increasing returns to scale–measurement of gains from trade and their distribution.

Economic Growth and International Trade

Introduction effect of growth on trade production and consumption effects of growth. combined effect – effects of growth on terms of trade, immiserizing growth technical progress and international growth import substitution and export promotion strategy.

Gains from Trade

Meaning – factors determining the gains from trade · gains from trade and income distribution measurement of gains from trade and their distribution – the gains from trade in the case of large and small country – free trade vs no trade – restricted trade vs no trade

Terms of Trade, Tariff and Protection

Concept of terms of trade – their uses and limitations – importance in the theory of trade - secular deterioration of terms of trade, its empirical relevance and policy implications for less developed countries trade as a engine of growth theories of terms of trade – views of British school, Rawl, and Singer and Prebisch– theory of intervention – economic effects of tariff on national income, terms of trade and income distribution effects of quotas – effective rate of protection.

Balance of Payment

Meaning structure and components of balance of payment equilibrium and disequilibrium in the balance of payment consequences of disequilibrium in the balance of payment – balance of payment and balance of trade – causes and methods of its correction (both monetary and non- monetary measures and their relative merits and demerits).

Balance of Payment and Policy

Automatic adjustment mechanism under Gold Standard Balance of Payment and national income expenditure reducing and expenditure switching policies – direct control for adjustment – policies for achieving internal and external balance.

6. DEVELOPMENT ECONOMICS

Economic Development (Meaning and Measurement)

Meaning of economic development – distinction between growth and development – new view of economic development (Dudley Seers view) – three core values of development: sustenance, self esteem and freedom – growth and environmental degradation – economic development and human welfare – measurement of economic development – limitations of using per capita income as a measure alternative e measures:PQLI and Human Development Index.

Economic Growth

Modern economic growth Kuznets six characteristics – relevance of historical growth experience to the under developed countries contemporary UD countries diverse structure and common characteristics.

Theories of Under Development and Development

Theories of under development: vicious circle of poverty, low level equilibrium trap, circular causation and backwash effect, dualism, dominance and dependence theories of development, classical theories (Smith, Ricardo, Malthus), Marxian theory of capitalist development, Schumpeterian analysis ofcapitalism.

Strategies for development

Big push - balanced vs unbalanced growth – Mahalanobis strategies balance between agriculture and industry import substitution vs export orientation neo-liberal vs interventionist policies.

Human Resource Management

Nature and Scope objectives nature of people and organizations–Personnel policies and principles--Environment of human resource management social systems human resource accounting and audit.

Human Resource Planning

Human resource/ manpower planning – meaning process of HR Planning – job analysis recruitment and selection - orientation and placement – orientation programmes

7. ENVIRONMENTAL ECONOMICS

Environmental Problems

Economic development and environmental problems–air pollution–water pollution sound pollution – energy use and environment problem – pollution and urbanization global warming and green house effect – health, urbanization, transport and technology - environmentaldegradation.

Policy measures

Basic approach – design of environmental policy Indian environment policies and performance – pollution control boards and their function.

Spatial Price Theory

Price equilibrium in geographically separated and interlinked markets; Market area boundaries; Reilly's law; Models of pricing under free entry; Spatial .monopoly and Price discrimination; Spatial monopolistic competition.

Techniques of Regional Analysis

Regional and interregional input-output analysis; Attraction model; Gravity model; Shift-share analysis; Impact studies.

Regional Policy

People prosperity versus Place prosperity; Formulation of interregional objectives; Consistency between national and regional objectives; Alternate regional policy measures; Historical evidence; Agriculture, Industry, Physical infrastructure, Social Sector.

8. POPULATION STUDIES

Introduction

Population study and demography; its relation with other disciplines; Theories of Population- Malthus, Optimum theory of population, and Theory of Demographic Transition; Historical evidence of population growth in developed and developing countries

Sources of Demographic Data in India

Sources of Demographic data in India: Census - Civil registration system and Demographic surveys; National Family Health Survey 1 and 2 - their relative merits and demerits

Techniques of Analysis

Crude birth and death rates, age specific birth and death rates, standardized birth and death rates- Study of Fertility; total fertility rate, gross reproduction rate, and net reproduction rate - study of marital status — Life table; meaning of its columns and its uses - Reproductive and child health in India - Temporal and spatial variation in sex ratios

Population Projection

Techniques of population projection - Concept of stationary, stable and quasi-stationary population - Aging of population in India - Changes in family structure and old age security

Population Policy

Salient features of Population Censuses of 1971,1981,1991 and 2001; Evolution of population policy in India,shift in policy focus from population control to family welfare and to women empowerment; Demographic status and house hold behavior- Education women's autonomy and fertility-Population, health, poverty and environment linkage in India; Migration - Urbanisation - The New populationPolicy

9. INDIAN ECONOMY

Planning in India

Objectives of planning – overview of plans in India approaches, outlays, targets and priorities, broad achievements and failures new economic reforms liberalization, privatization and globalization – rationale behind economic reforms – progress of privatization and globalization.

Indian Agriculture

Nature and significance of agriculture trends in agriculture production and productivity – factors determining productivity – progress of agriculture under the five year plans new agriculture strategy and green revolution – land reforms – irrigation, rural credit, marketing and warehousing agricultural labour.

Indian Industries

Role of Indian industries – industrial development during the planning period industrial policies licensing policy growth and problems of some large scale industries: iron and steel, cotton, jute, sugar and cement- growth and problems of small scale enterprises role, growth and problems of public sector enterprises inIndia.

Indian Currency, Financial System and Public Finance

Indian currency systems today – sources of broad of money (m3) : factors affecting money supply in India – progress of banking in India since 1969 role of reserve bank of India in Indian economic development competition of India's capital and money markets–revenues and expenditure of central government current central budget revenue and expenditure of state government – financial relation between the centre and states.

Important Areas of Concern

Poverty and inequality in India Rising unemployment, rising prices, industrial Relations regional disparities Environmental degradation-parallel economy.

10. MATHEMATICS FOR ECONOMISTS

Matrices and Matrix Operations

Addition, scalar multiplication, matrix multiplication–the transpose–the inverse of a square matrix – rank of matrix invertibility and rank for square matrices, characteristic roots and eigen values, Cramerrule.

Determinants

Determinats – definition, properties, minors and cofactors – expansion by alien cofactors singularity and invertibility the adjoint matrix and formula for the inverse.

Elementary Topics in Calculus

The derivative of a function - differentiability and continuity – techniques of differentiation – sums, products and quotients of functions - composite functions and the chain rule – inverse functions - second and higher order derivatives.

Advanced/Higher Calculus

The second derivative criterion points of inflexion – differentials and linear approximation–exponential and logarithmic functions–logarithmic differentiation partial differentiation tangent planes to a surface – higher order partial derivatives – partial derivatives in economics the chain rule first and higher order derivatives of functions defined implicitly.

Problem of Optimization

Homogeneous functions–elasticity of substitution-concave and convex functions–convex sets – maxima and minima saddle points – unconstrained optimization - necessary and sufficient conditions for local optima – constrained optimization (equality constraints) – the method of Lagrange multipliers – interpretation of the necessary conditions and of the Lagrange multiplier sufficient conditions – economic examples.

Applications in Economics

The role of concavity and convexity applications, profit maximization of firms, utility maximization and cost minimization using optimization - integration and its application in economics.

11. STATISTICAL METHODS

Measures of Central Tendency and Partition Values

Meaning of average – types of average: arithmetic mean(for raw data, ungrouped frequency distribution and grouped frequency distribution),median (forraw data, ungrouped frequency distribution and grouped frequency distribution), mode (for raw data, ungrouped frequency distribution and grouped frequency distribution), geometric mean, harmonic mean (along with formula for each type of average, respective merits, demerits, uses and properties) – quartiles(for individual series, discrete frequency distribution and frequency distribution with class interval) – deciles (for individual series, discrete frequency distribution and frequency distribution with class interval) – percentiles (for individual series, discrete frequency distribution and frequency distribution with classinterval).

Measures of Dispersion

Meaning of dispersion · types of dispersion: range, quartile deviation, mean deviation, standard deviation and variance (along with absolute measure, the relative measure or coefficient of each type of dispersion) – coefficient of variation · combined standard deviation – Lorenz curve (application in income distribution).

Skewness and kurtosis

Skewness–meaning of skewness and symmetry in a distribution–symmetrical distribution–asymmetrical or skewed distribution negatively skewed and positively skewed, measures of skewness: absolute measure–Karl Pearson's coefficient of skewness Bowley's coefficient of skewness – definition, types and measures of kurtosis · Karl Pearson's coefficient of kurtosis.

Correlation

Concept of correlation types of correlation - bivariate distribution and covariance simple correlation Karl Pearson's product moment coefficient of correlation measure partial correlation: definition and measure (ceteris paribus assumption) multiple correlation: definition and measure(long run production function) – Spearman's rank correlation coefficient(when ranks are given, when ranks are not given and when equal ranks are given) – properties and uses of correlation.

Regression Analysis

Meaning of regression – types of regression – simple and multiple linear and non-linear regressions–concept and method of least squares line of best fit–regression coefficients– line of regression of x on y (aggregate consumption function) –line of regression on y on x (accelerator) – properties of regression coefficients – utility regression analysis in economic studies – coefficient of determination.

SYLLABUS FOR WRITTEN RECRUITMENT EXAMINATION FOR THE POST OF POST GRADUATE ASSISTANT

SYLLABUS :POLITICAL SCIENCE

1. **Foundations of Political Science.**
   a) Political Science Meaning.
   b) Scope of Political Science
      1) Scope of political science concerning the State.
      2) Scope of political science with reference to Human Rights
      3) Scope of political science in relation to Government
   c) Political Science and other Social Sciences.
      1)History 2)Geography3)Economics 4)Sociology 5) Philosophy
   d) Political Science as Art or Science
   e) Approaches to Study of Political Science.
      Traditional Approach:
      1) Philosophical 2) Historical 3) Institutional 4) Legal
      Modern Approach:
      1) Behaviouralism, 2) Post – Behaviouralism

2. **Political Theory (State and Society)**
   a) Definition of State (City, Feudal, Nation, Socialist, Welfare)
   b) Definition of Society
   c) Theories: (Divine origin Theory, Social contract, Matriarchal, Patriarchal, Force, Historical Theories, Social Contract, Evolutionary, Marxian)
   d) Sovereignty : Monism and Pluralism, Changing Nature of Sovereignty in Globalization.
   e) The concept of Civil Society and Public Sphere
   f) Nation and Nationalism

3. **Democracy.**
   a) Democracy Evolution, Meaning, Importance. History
   b) Direct and Indirect democracy, Deliberative – Participative.
   c) Conditions necessary for a successful democracy.
   d) Constitutional Democracy, Prerequisites of Democracy.

4. **Structure of Government.**
   a) Theory of Separation of powers.
   b) Rule Making – Legislature – Functions – Types.
   c) Rule application - Executive Functions – Types.
   d) Rule adjudication Judiciary - Judiciary review – Rule of Law – Administrative Law.
   e) Powers of High Court and Supreme Court.

5. **Political Dynamics.**
   a) Political Parties – Functions – Systems – Types – Need for Political Party.
   b) Interest Groups and Importance and Functions.
   c) Type of Elections – Representation - Minority Representation (Hare Systems, List Systems, Proportional Representation)

6. **Judiciary: (Law, Liberty, Justice, Equality)**
   a) Meaning of Law, Source of Law, Kinds of Law
   b) Meaning of Liberty, Kinds of Liberty.
   c) Meaning of Justice, Sources of Justice, Justice and society
   d) Meaning of Equality, Kinds of Equality, Objectives of Equality,
   e) Liberty and Equality
   f) Importance of Individual Freedom
   g) Human Rights
   h) Citizenship
   i) Property

7. **Introduction to Indian Constitution.**
   a) Meaning and definition of Constitution.
   b) Need of Constitution.
   c) Constitution of Government
   d) Constitution of Sovereignty
   e) Written Constitution
   f) Flexible Constitution
   g) Rigid Constitution
   h) President
   i) Local Body Government

8. **Western Political Thought**
   a) Plato
   b) Aristotle
   c) Machiavelli
   d) Hobbes
   e) John Locke
   f) Rousseau
   g) J.Bentham
   h) Montesquieu
   i) J.S.Mill
   j) Karl Marx

9. **International Politics**

a) Nature and Scope of International Politics b) Determinants of Foreign Policy
c) National Power and National Interest d) Balance of Power
e)Diplomacy Foreign Policy of India f) U.N.O.