TELANGANA STATE PUBLIC SERVICE COMMISSION :: HYDERABAD

Notification No. 07/2020,Dt: 14/08/2020

SPECIAL QUALIFYING TEST FOR NON – TEACHING STAFF OF THE DEPARTMENT OF TECHNICAL EDUCATION.

PARA – 1:

Applications are invited On-line from Non – teaching staff of the department of Technical Education who are appointed by promotion as Lecturers in Government Polytechnic Colleges in the State of Telangana.

The profoma Application will be available on Commission's Website (**www.tspsc.gov.in**) from **18/08/2020 to 11/09/2020** (**Note:11/09/2020 is the last date for payment of fee up to 11:59 mid night**)

Before applying for the test, an applicant shall register his/her bio-data particulars through Emp-ID on the Commission's Website viz., **www.tspsc.gov.in** Once applicant registers his/her particulars, a User ID is generated and sent to his/her registered mobile number and email ID. Applicants need to apply for the test using the Emp-ID through Commission's website.

Hand written / Typed /Photostat copies/Printed Application Form will not be entertained either directly or by post Office or in person.

The Examination (Objective Type) dates will be announced later. The Examination is likely to be held On-line though COMPUTER BASED RECRUITMENT TEST (CBRT). Instructions regarding computer-based or OMR test are attached at **Annexure-II**.

PARA-2

Eligibility to appear for the Test

1. Only the Non – teaching staff working in the department of Technical Education and governed by TS Technical Educational Service Rules issued in G.O.Ms.No. 178, Higher Education (TE.IA) Dept. Dt. 09.12.2005 and G.O.Ms.No.254, Higher Education (TE.1) Dept., dt:30.10.2008 and as per the Rules and Instructions issued by the Government who are appointed by promotion as Lecturers in Government Polytechnic Colleges.
2. **Special condition prescribed for test:** The applicants who are working in the Department of Technical Education the service certificate format given below shall be fill and get the signature with seal of the controlling Officer of Department. The service certificate duly signed by the controlling officer should be scanned and uploaded. Otherwise their applications will be summarily rejected.

Service Certificate

This is to certify that Sri./Smt./Kum. _____ is working as _____From_____to _____(Total service rendered_____)In the office of _____.

Station: Signature:

Date: Name and Designation of Controlling Officer
With Office seal (if not signed by the Controlling Officer, the application will be rejected.

3. Educational Qualification:

As per the G.O.Ms.No.254, Higher Education (TE.1) Dept., dt: 30.10.2008 apart from the following required academic qualification, one must also qualify in the Special Qualifying Test to be conducted by the Telangana State Public Service Commission.

Sl.No.	Subjects	Educational Qualification
I	**Non-Engineering** i) English ii) Maths iii) Chemistry iv) Physics	Must Possess a first-class Master's degree in concerned subject from any university in india recognized by UGC or AICTE
	v) Computer and Commercial Practice (to teach commerce type writing and Shorthand Subject)	(i) Must possess a first-class Master's Degree in commerce (ii) Typewriting in Higher grade in English and shorthand higher grade in English conducted by the State board of Technical Education and Training.
	vi) Computer and Commercial Practice (to teach computer practice)	(i) Must possess Bachelor's Degree in Commerce. **AND** (ii) Must possess 1st class Master's Degree in computer Application (MCA) from an Institution recognized by AICTE.
II	**Engineering:** i) ECE ii) Mechanical iii) Computer Engg iv) EIE v) CIVIL Engg vi) Metallurgical &Material Engg vii) Computer Science &Engg. viii) EEE	Must possess a first-class Bachelor's Degree in appropriate branch of Engg/Technology as recognized by AICTE or its Equivalent.

Note: Relaxation of 5 % marks is available for the applicant in Academic Qualifications belongs to SC/ST, i.e., 55% marks is enough for the purpose of qualification to Special Qualifying Test (as per G.O.Ms.No. 178, Higher Education (TE.IA) Dept. Dt. 09.12.2005

PARA - 3 HOW TO APPLY:

The Applicants are instructed to read the notification thoroughly before applying. For any details and clarifications, the applicants are advised to visit Commission's Official web-site http://www.tspsc.gov.in.

The applicants are instructed to be careful while submitting the details at the time of submission of on-line application as the details once submitted cannot be amended at all. It is applicant's responsibility that the details submitted are true and genuine. Representation or request in what so ever manner may not be entertained in this regard.

STEP 1:-The applicants have to login to the website (www.tspsc.gov.in) and to first fill SQT Application form with their basic details like Name, Father Name, DOB, EMP-ID etc.. and get their OTP to Mobile phone or email-ID. While filling the same, the applicants have to ensure that there are no mistakes done. The Commission bears no responsibility for the mistakes made by the applicants.

STEP 2: - After entering the OTP the applicant has to fill his/her Employment details such as Emp.ID, Department, Date of joining, present designation, Teaching subject etc.,

STEP 3:- Scan and upload the Service Certificate with attestation of Controlling Officer.

STEP 4:- The applicant has to fill his/her Graduation details.

STEP 5:- Filling the post details i.e Engineering / Non-engineering and select the respective Optional Subject.

Note:- While applying, the Applicant should opt his optional subject according to his/her academic qualifications otherwise his/her candidature is liable to reject.

STEP.6:- Immediately on entering the above details and clicking on Pay Now button, the applicants will be redirected to the Payment Gateway page.

STEP.7:- The applicant should pay the prescribed fee as specified using his/her desired payment mode (Internet Banking / Credit Card / Debit card) available in the Payment gateway. Separate instructions have to be followed for each mode of payment.

STEP.8:-After successful payment of fee, the Application receipt will be generated which contains the particulars furnished by the applicants. The Application Reference Number in the Application form has to be quoted for future reference/correspondence. The Applications received On-line in the prescribed proforma provided in the Commission's website within the stipulated time shall only be considered and the Commission will not be held responsible for any kind of discrepancy.

NOTE:

- **I.** While filling the application form, the applicants have to ensure that all fields are filled with no mistakes. The Commission bears no responsibility for the mistakes/omissions, if any, made by the applicants.
- **II.** The particulars furnished by the applicant in the Application Form will be taken as final, and data entry is processed based on these particulars only by Computer. Applicants should, therefore, be very careful in Uploading / Submitting the Application Form On-line.
- **III.** Applicants shall note that, the details available in the application form submitted by them will be considered for the purpose of this notification. Any requests to change the details subsequently will not be entertained under any circumstances.
- **IV.** The applicants should not furnish any false particulars tampered, fabricated or suppress any material information while making an application through website.
- **V.** For any technical problems related to Online submission and downloading of Hall tickets contact 040-22445566 (Call Time: 10.30 A.M to 1.00 P.M & 1.30 P.M to 5.00 P.M) or mail to helpdesk@tspsc.gov.in OR TSPSChelpdesk@gmail.com.

***PARA - 4:* FEE & MODE OF PAYMENT OF FEE**

(i) The fee payable towards application fee of this notification shall be **Rs. 200/-** (RUPEES TWO HUNDRED ONLY).

(ii) The applicants should pay **Rs.120/-** (RUPEES ONE HUNDRED TWENTY ONLY) towards Examination fee in addition to the Application fee payable to the Principal Secretary, T.S. Public Service Commission, Hyderabad through Net-Banking/Debit/Credit Card in TS On-line or e-pay from _____**to**_____ by 11:59 PM. The list of Banks providing service for the purpose of online remittance of fee is given in ***ANNEXURE – I.***

(iii) The application of the applicant is admitted provisionally subject to reconciliation of the fee from the Bank.

(iv) Any fee once remitted under this Notification, shall not be refunded or adjusted under any circumstances. Failure to pay the requisite Examination fee, Application fee will entail total rejection of application.

(v) IPOs/Demand Drafts are not accepted.

PARA- 5: SCHEME AND SYLLABUS: - The Scheme & Syllabus for the examination has been shown in ***ANNEXURE – III***.

PARA - 6 : CENTRES FOR THE ON-LINE EXAMINATION :

The Examination will be held at **Hyderabad only**. However the Commission reserves the right to allot the applicant to any centre or duly creating a new centre for administrative reasons of examination depending on the availability of the resources like centres / systems.

PARA- 7: PROCEDURE OF SELECTION:

The selection to this Test will be based on the Scheme & Syllabus shown at **Annexure-III**

THE FINAL SELECTION WILL BE BASED ON MARKS SECURED IN THE WRITTEN EXAMINATION (EITHER ONLINE OR OMR BASED) AND INTERVIEW / PERSONALITY ASSESMENT TEST MARKS PUT TOGETHER.

1. The applicants qualified in the Written examination will be called for Interview / Oral Test failing which his/her candidature is liable for rejection for further selection process.
2. The applicants qualified in the Written Examination will be short listed for Interview/ Oral Test representing Community and Category. The minimum qualifying marks for selection are OCs 40%, BCs 35% SCs, STs and PHs 30%.
3. The applicant should qualify both in Written Examination and also in Oral Test / Interview. The minimum qualifying marks for interview will be decided by the commission.
4. The final selection to this SQT will be based on marks secured in the Interview / Oral Test and in Written Examination.
5. The attending Exams in all the papers at the Written Examination as per rules is compulsory. Absence in any of the paper/papers will automatically render his/her candidature as disqualified

PARA 8 : MEMORANDUM OF MARKS:

i) Marks will, however, be supplied to applicants, who are not successful at the Examination. Memorandum of Marks can be downloaded on payment of Rs. 200/- (Rupees Two Hundred Only) through Online Payment in favour of the Principal Secretary, T.S. Public Service Commission, Hyderabad. Applicants will be allowed to download the marks after one week from the date of declaration of results within a period of ONE MONTH from the date of display of results on the Commission's Notice Board.

Note:- Requisitions made under any means without following the above conditions shall not be entertained under any circumstances.

iii) Attendance / appear confirmation certificate to applicants shall not be provided.

PARA 9 : DEBARMENT:

a) Applicant is liable to be debarred from appearing for any examination permanently or for such term of years as the Commission may think fit for the below reasons :

(i) If incorrect information is furnished in Application or elsewhere, or makes a false declaration regarding eligibility, Service etc.

(ii) If he/she is found guilty of malpractice of any kind in the Examination hall.

(iii) If he/she behaves improperly towards the Chief Superintendent/ Invigilators/Deputed Officials of TSPSC in the premises of venue or in the Examination Hall.

(iv) Any applicant is or has been found impersonating or procuring impersonation by any person or resorting to any other irregular or improper means in connection with his / her candidature for notification or obtaining support of candidature by any means, such a applicant may in addition to rendering himself/ herself liable to criminal prosecution, will be debarred.

b) Penal provisions of the Public Examinations (Prevention of Mal practice & Unfair Means) Act 1997 (Act No.25/97) published in A.P. Gazette No. 35 Part-IV-B Extraordinary, dated: 21.08.1997 shall be invoked if malpractice & Unfair means are noticed at any stage of examination and the applicant will be debarred from writing any TSPSC examination in future.

PARA-10: COMMISSION'S DECISION TO BE FINAL:

The decision of the Commission in all aspects and all respects pertaining to the application and its acceptance or rejection as the case may be, conduct of examination and at all consequent stages culminating in the selection or otherwise of any applicant shall be final in all respects and binding on all concerned, under the powers vested with it under Article 315 and 320 of the Constitution of India. Commission also reserves its right to alter and modify time and conditions laid down in the notification for conducting the various stages up to selection, duly intimating details thereof to all concerned, as warranted by any unforeseen circumstances arising during the course of this process, or as deemed necessary by the Commission at any stage

HYDERABAD ***Sd/-***
DATE:14/08/2020 ***PRL.SECRETARY***

ANNEXURE-I

List of Banks for making online payment.

STATE BANKGROUP	5.Oriental Bank of Commerce	17.Lakshmi Vilas Bank	6.Punjab National Bank
1.State Bank of India	6.United Bank of India	18.Punjab & Sind Bank	7.Union Bank of India
2.State Bank of Bikaner & Jaipur	7.Vijaya Bank	19.IDBI Bank	**LIST – C**
3.State Bank of Hyderabad	8.City Union Bank	20.Indusind Bank	1.HDFC Bank
4.State Bank of Mysore	9. Catholic Syrian Bank	21.Syndicate Bank	2.ICICI Bank
5.State Bank of Patiala	10.Federal Bank	**LIST – B**	3.Bank of Bahrain and Kuwait
6. State Bank of Travancore	11. ING Vysya Bank	1.Canara Bank	4.Citi Bank
LIST - A	12.Jammu & Kashmir Bank	2.Central Bank of India	5.Indian Overseas Bank
1.Bank of Maharashtra	13. KarurVysya Bank	3.Deutsche Bank	6.Karnataka Bank
2.Corporation Bank	14.South Indian Bank	4.Dhanalaxmi Bank	7.Ratnakar Bank
3.Dena Bank	15.Tamilnadu Mercantile Bank	5.Kotak Bank	
4.Indian Bank	16.DCB Bank		

CHANNEL		**AMOUNT RS.**	**PRICING IN RS.**
Internet Banking			
State Bank Group (6 Banks)		All amounts	Rs.3/-per transaction +Taxes
All other Banks	List-A (21 Banks)	All amounts	Rs.5/-per transaction +Taxes
	List-B (7 Banks)	All amounts	Rs.8/-per transaction +Taxes
	List-C (7 Banks)	All amounts	Rs.12/-per transaction +Taxes
Debit Card			
All Banks (Master/Mastreo/Visa/Rupay)		Up to 2000/-	0.75 % of the transaction amount + Taxes
		2001/- & above	1.00% of the transaction +Taxes
Credit card (Master/Visa/AMEX/Rupay)		All amounts	1.00% of transaction amount + Taxes
IMPS – Mobile payments		All Amounts	Rs. 7/- of the transaction Amount + Taxes

Annexure-II

INSTRUCTIONS TO APPLICANTS:

A) INSTRUCTIONS TO APPLICANTS:

- THE APPLICANTS ARE REQUIRED TO GO THROUGH THE USER GUIDE AND SATISFY THEMSELVES AS TO THEIR ELIGIBILITY FOR THIS RECRUITMENT CAREFULLY BEFORE APPLYING AND ENTER THE PARTICULARS COMPLETELY ONLINE.
- APPLICANT MUST COMPULSORILY FILL-UP ALL RELEVANT COLUMNS OF APPLICATION AND SUBMIT APPLICATION THROUGH WEBSITE ONLY. THE PARTICULARS MADE AVAILABLE IN THE WEBSITE WILL BE PROCESSED THROUGH COMPUTER AND THE ELIGIBILITY DECIDED IN TERMS OF NOTIFICATION AND CONFIRMED ACCORDINGLY.
- THE APPLICATIONS RECEIVED ONLINE IN THE PRESCRIBED PROFORMA AVAILABLE IN THE WEBSITE AND WITHIN THE TIME SHALL ONLY BE CONSIDERED AND THE COMMISSION WILL NOT BE HELD RESPONSIBLE FOR ANY KIND OF DELAY/DISCREPANCY ON PART OF THE APPLICANT.
- APPLICANTS MUST COMPULSORILY UPLOAD HIS/HER OWN SCANNED PHOTO AND SIGNATURE THROUGH J.P.G FORMAT.
- THE APPLICANTS SHOULD NOT FURNISH ANY PARTICULARS THAT ARE FALSE, TAMPERED, FABRICATED OR SUPPRESS ANY MATERIAL INFORMATION WHILE MAKING AN APPLICATION THROUGH WEBSITE.
- IMPORTANT:- HAND WRITTEN/TYPED/PHOTOSTAT COPIES/PRINTED APPLICATION FORM WILL NOT BE ENTERTAINED.

B) INSTRUCTIONS REGARDING ON-LINE EXAMINATION FOR APPLICANTS:

1) The applicants should take their seats at the prescribed time before the commencement of the examination. Biometric identification would be conducted before entry into examination hall. The entry time would be mentioned in the hall ticket. Late entry after the given entry time would not be allowed. Applicants should not leave the examination hall till the expiry of fulltime. Loaning and interchanging of articles among the applicants is not permitted in the examination hall. Electronic devices including cell phones and pagers are not allowed in the examination hall. Non programmable calculators would be permitted, wherever necessary.

2) The starting time of each examination paper and the entry time would be mentioned in the hall ticket

3) Applicants will not be permitted to leave the examination hall till the expiry of full time. If any applicant leaves the examination hall in the middle, he would be disqualified. If there is any problem with computer system, the applicants have to wait without talking to others till the system is restored. In case of any violation, the applicant will be disqualified.

4) The examination link with the login screen will already be available on your system. Please inform the invigilator if this is not the case.

5) 10 minutes prior to the exam, you'll be prompted to login. Please type the Login ID (Roll No) and the Password (Password for Applicant will be given on exam day) to proceed further.

6) Invigilator will announce the password 15 minutes before commencement of the Examination.

7) Copying or noting down questions and/or options is not allowed. Severe action will be taken if any applicant is found noting down the questions and/or options.

8) After logging in, your screen will display:

**Profile Information - Check the details & click on "I Confirm" or "I Deny".*

**Detailed exam instructions - Please read and understand thoroughly.*

**Please click on the "I am ready to Begin" button, after reading the instructions.*

9) You have to use the mouse to answer the multiple choice type questions with FOUR alternative answers.

10) To answer any numerical answer type question, you need to use the virtual numeric key pad and the mouse.

11) On the online exam question screen, the timer will display the balance time remaining for the completion of exam.

12) The question numbers are color coordinated and of different shapes based on the process of recording your response: White (Square) - For un-attempted questions. Red (Inverted Pentagon) - For unanswered questions. Green (Pentagon) - For attempted questions. Violet (Circle) - Question marked by applicant for review, to be answered later. Violet (Circle with a Tick mark) - Question answered and marked by applicant for review.
13) After answering a question, click the SAVE & NEXT button to save your response and move onto the next question.

14) Click on Mark for Review & NEXT to mark your question for review, and then go to the next question.

15) To clear any answer chosen for a particular question, please click on the CLEAR RESPONSE button.

16) A summary of each section, (i.e. questions answered, not answered, marked for review) is available for each section. You have to place the cursor over the section name for this summary.

17) In case you wish to view a larger font size, please inform the Invigilator. On the Invigilator's confirmation, click on the font size you wish to select. The font size will be visible on the top.

18) You may view INSTRUCTIONS at any point of time during exam, by clicking on the INSTRUCTIONS button on your screen.

19) The SUBMIT button will be activated after 150 Minutes. Please keep checking the timer on your screen.

20) In case of automatic or manual log out, all your attempted responses will be saved. Also, the exam will start from the time where it had stopped.

21) You will be provided a blank sheet for rough work. Do write your Login ID and Password on it. Please ensure that you return it to the invigilator at the end of the exam after tearing only the password from it.

22) Please don't touch the key board as your exam ID will get locked. If your ID gets locked, please inform a nearby invigilator who will help in unlocking your ID and then you can continue with the exam.

23) Please inform the invigilator in case of any technical issues.

24) Please do not talk to or disturb other applicants.

25) In case you are carrying articles other than the admit card, photo identity proof and pen, please leave them outside the exam room.

26) You cannot leave exam room before submitting the paper. Please inform the invigilator if you want to use the wash room.

C) GENERAL INSTRUCTIONS TO APPLICANTS:

1) If the applicant notices any discrepancy printed on the Hall ticket, as to community, date of birth etc., he/she may immediately bring it to the notice of Commission's officials/Chief Superintendent in the examination centre and necessary corrections can be made in the Nominal Roll, in the Examination Hall against his/her Hall Ticket Number for being verified by the Commission's Office.

2) The applicant should satisfy the Invigilator of his/her identity with reference to the signature and photographs available on the Nominal Rolls and Hall Ticket.

3) The applicants should take their seats at the given time before the commencement of the examination and are not to be allowed after the scheduled time. The time of Examination and entry time would be mentioned in the hall ticket. Late entry after the given entry time would not be allowed. Applicants should not leave the examination hall till the expiry of fulltime.

4) The applicants must note that his/her admission to the examination is strictly provisional. The mere fact that an Admission to the examination does not imply that his/her candidature has been finally cleared by the Commission or that the entries made by the applicant in his/her

application have been accepted by the Commission as true and correct. The applicants have to be found suitable after verification of original certificates; and other eligibility criteria. The Applicants have to upload his/her scanned recent colour passport photo and signature to the Application Form. Failure to produce the same photograph, if required, at the time of interview/ verification, may lead to disqualification. Hence the applicants are advised not to change their appearance till the examination process is complete.

5) The applicants are not allowed to bring any Electronic devices such as mobile / cellphones, programmable calculators, tablets, iPad, Bluetooth, pagers, watches or any other computing devices to examination Hall. Non programmable calculators would be permitted, wherever necessary. Loaning and interchanging of articles among the applicants is not permitted in the examination hall and any form of malpractice will not be permitted in the exam hall.

6) The applicants are expected to behave in orderly and disciplined manner while writing the examination. Their candidature will be rejected in case of impersonation/ disorder/ rowdy behaviour during Examination and necessary F.I.R. for this incident will be lodged with concerned Police Station. The Chief Superintendent of the centre is authorized to take spot decision in this matter.

7) Applicants trying to use unfair means shall be disqualified from the selection. No correspondence whatsoever will be entertained from the applicants.

8) The Penal Provisions of Act 25/97 published in the A.P. Gazette No. 35, Part-IV.B Extraordinary dated: 21/08/1997 shall be invoked if malpractice and unfair means are noticed at any stage of the Examination. Action will be taken to penalize as per G.O.Ms.No.385, G.A. (Ser. A) Dept., Dt.18/10/2016.

9). (a) Wherever the applicants are totally blind, they will be provided a scribe to write the examination and 20 minutes extra time is permitted to them per hour. Eligible applicants are also allowed to bring their own scribe after due intimation to the Commission after duly providing the full identification details of the scribe like name, address and appropriate proof of identification.

(b) The applicants shall upload the certificate relating to percentage of disability for considering the appointment of scribe in the examination.

(c) An extra time of 20 minutes per hour is also permitted for the applicants with locomotor disability and CEREBRAL PALSY where dominant (writing) extremity is affected for the extent slowing the performance of function (Minimum of 40% impairment). No scribe is allowed to such applicants.

(d) The applicant as well as the scribe will have to give a suitable undertaking conforming to the rules applicable

10). In case the Hall-Ticket is without photo or too small, he/she should affix a passport size photo on Hall-ticket and appear by duly getting attested by Gazetted Officer. He/she shall handover similar photo for each paper to Chief Superintendent for affixing the same on the Nominal Rolls.

11) The applicant will not be admitted to the examination Hall without procedural formalities.

12) The applicant admission to the Examination is provisional, subject to the eligibility, confirmation/satisfaction of conditions laid down in this notification.

13) The applicants should put his/ her signature and get the signature of the invigilator at the appropriate places in the Nominal Roll.

14) Instructions to be followed scrupulously in the Examination Hall.

ANNEXURE-III

TELANGANA STATE PUBLIC SERVICE COMMISSION:: HYDERABAD

Scheme and Syllabus of Special Qualifying Test (SQT) for the post of **Lecturers** in Engineering and Non-Engineering subjects in Department of Technical Education.

Subject	No. of Questions	Duration (minutes)	Maximum marks
Part: A Written Examination (Objective Type) **Paper-I**: General Studies & General Abilities	150	150	150
Paper-II: Concerned Subject	150	150	300
Part: B: Interview			50
		TOTAL	500

List of Concerned Subject	
1.English (PG Standard)	7. Electronics and Communication Engineering (Degree Standard)
2.Mathematics (PG Standard)	8. Mechanical Engineering (Degree Standard)
3. Physics (PG Standard)	9. Electronics and Instrumentation Engineering (Degree Standard)
4. Chemistry (PG Standard)	10. Civil Engineering (Degree Standard)
5.Commercial and Computer Practice (to teach Commerce, Typewriting and Shorthand subject) (PG Standard)	11. Metallurgical and Material Engineering (Degree Standard)
6. Commercial and Computer Practice (to teach computer practice) (Commerce Degree Standard and Computers PG Standard)	12. Computer Science Engineering (Degree Standard)
	13. Electrical and Electronics Engineering (Degree Standard)

Name of the Papers	Language of Examination
Paper-I: General Studies & General Abilities	Bilingual i.e., English and Telugu
Paper-II: Concerned Subject	English Only

SYLLABUS

PAPER.I. GENERAL STUDIES AND GENERAL ABILITIES

1. Current affairs – Regional, National and International.
2. International Relations and Events.
3. General Science; India's Achievements in Science and Technology.
4. Environmental issues; Disaster Management- Prevention and Mitigation Strategies.
5. Economic and Social Development of India and Telangana.
6. Physical, Social and Economic Geography of India.
7. Physical, Social and Economic Geography and Demography of Telangana.
8. Socio-economic, Political and Cultural History of Modern India with special emphasis on Indian National Movement.
9. Socio-economic, Political and Cultural History of Telangana with special emphasis on Telangana Statehood Movement and formation of Telangana state.
10. Indian Constitution; Indian Political System; Governance and Public Policy.
11. Social Exclusion; Rights issues such as Gender, Caste, Tribe, Disability etc. and inclusive policies.
12. Society, Culture, Heritage, Arts and Literature of Telangana.
13. Policies of Telangana State.
14. Logical Reasoning; Analytical Ability and Data Interpretation.
15. Basic English (10th Standard)

PAPER-II : ENGLISH

I. Genres, Movements, Schools, Concepts.

- Renaissance-Reformation, Metaphysical poetry, Neo-classicism, Puritanism, Restoration, Romanticism, Victorian Age, Realism-Naturalism, Expressionism, Symbolism, Modernism, Postmodernism.
- Structuralism, Poststructuralism, Feminism, Postcolonialism, Diaspora, Race Gender and Caste.
- English Literary Criticism from Philip Sydney to Matthew Arnold
- New Criticism, Formalism, Archetypal criticism, New Historicism, Psychoanalytical criticism, Reader response criticism.
- Literary Genres: Poetry, Fiction, Prose, Drama (origins and development, elements, forms, types)

II. Writers and Texts

• Christopher Marlowe	Doctor Faustus
• William Shakespeare	Hamlet
• John Milton	Paradise Lost-Book 1
• William Wordsworth	"Immortality Ode", Tintern Abbey
• Robert Browning	"My Last Duchess", "Andrea del Sarto"
• Thomas Hardy	Tess of the d' Urbervilles
• TS Eliot	The WasteLand

• G.B. Shaw	Saint Joan
• Virginia Woolf	“A Room of One’s Own”
• William Golding	Lord of the Flies
• Walt Whitman	“When Lilacs Last in the Dooryard Bloomd”,”Crossing Brooklyn Ferry”
• Arthur Miller	Death of a Salesman
• Toni Morrison	Beloved
• Mulk Raj Anand	Untouchable
• Kamala Das	“An Introduction”, “The Old Playhouse”
• GirishKarnad	Hayavadana
• Salman Rushdie	Midnight’s Children
• Chinua Achebe	Things Fall Apart
• Margaret Atwood	Edible Woman
• Derek Walcott	Dream on MonkeyMountain

III English Language Teaching

1. ELT in India : (History and status of English in India; English as Second Language, English as Foreign Language, and English as Global Language).
2. Methods and Approaches: (Grammar Translation method, Direct method, Audio-Lingual method; Structural approach, Communicative language teaching)
3. Teaching of Language Skills : (Teaching of Listening, Speaking, Reading, and Writing Skills; Teaching of Grammar and Functional English; Teaching of Vocabulary; Classroom techniques; Use of authentic materials) Teaching literature.
4. Testing and Evaluation: (Principles, Types, Objectives of testing and evaluation)
5. Phonetics and Phonology; Syntax and Structure.

IV. Literary comprehension-(Excerpts from poetry and prose for comprehension

PAPER-II: MATHEMATICS

I. Real Analysis

Finite, Countable and Uncountable sets – Real Number system R – Infimum and Supremum of a subset of R – Bolzano- Weierstrass Theorem- Sequences- Convergence- Limit Superior and Limit Inferior of a Sequence- Sub sequences- Heine- Borel Theorem- Infinite Series – Tests of Convergence- Continuity and Uniform continuity of a real valued function of a real variable- Monotonic Functions - Functions of Bounded Variation- Differentiability and Mean Value Theorems- Riemann Integrability- Sequences and Series of Functions

II. Metric Spaces

Metric spaces – Completeness- Compactness- Connectedness – Continuity and Uniform continuity of a function from one metric space into another-Topological Spaces – Bases and Subbases – Continuous functions

III. Elementary Number Theory

Primes and Composite numbers – Fundamental Theorem of Arithmetic – Divisibility – Congruences – Fermat's theorem – Wilson's Theorem – Euler's Phi - Function

IV. Group Theory

Groups- Subgroups- Normal Subgroups- Quotient groups- Homomorphisms- IsomorphismTheorems- Permutation groups- Cyclic groups- Cayley'stheorem.Sylow's theorems -Their applications

V. Ring Theory

Rings- Integral domain- Fields- Subrings - Ideals – Quotient rings – Homomorphisms – Prime ideals- Maximal ideals – Polynomial rings – Irreducibility of polynomials – Euclidean domains- Principal ideal domains

VI. Vector Spaces

Vector Spaces, Subspaces – Linear dependence and independence of vectors – basis and dimension – Quotient spaces – Inner product spaces – Orthonormal basis – Gram- Schmidt process

VII. Theory of Matrices

Linear Transformations – Rank and nullity – Change of bases- Matrix of a Linear Transformation –Singular and Non-singular matrices – Inverse of a matrix – Eigenvalues and Eigenvectors of a matrix and of a Linear Transformation – Cayley- Hamilton's theorem- Quadratic forms- Signature

and Index

VIII. Complex Analysis

Algebra of Complex Numbers – The Complex Plane – Complex Functions and Their Analyticity – Cauchy-Riemann equations – Mobius transformations- Power Series-Complex Integration – Cauchy's Theorem – Morera's Theorem – Cauchy's Integral Formula – Liouville's Theorem – Maximum Modules Principle – Schwarz's Lemma – Taylor's Series – Laurent's Series-Calculus of Residues – Evaluation of Integrals

IX. Ordinary Differential Equations

Ordinary Differential Equations (ODE) of First order and First degree – Different methods of solving them – Exact Differential equations and Integrating factors- ODE of First order and Higher degree – Equations solvable for p, x and y – Clairaut's equations – Singular Solutions- Linear Differential Equations with Constant Coefficients and Variable Coefficients – Variation of Parameters

X. Partial Differential Equations

Formation of Partial Differential Equations (PDE) – Lagrange and Charpit's methods for Solving first order PDEs – Cauchy problem for first order PDEs- Classification of Second Order PDE's – General Solution of Higher Order PDEs with Constant Coefficients

XI. Solid Geometry

The Plane- Right line- Sphere- Cones and Cylinders

PAPER-II: PHYSICS

I. Mathematical Methods of Physics

Dimensional analysis, vector algebra and vector calculus. Linear algebra, matrices, cayley-Hamilton Theorem. Eigen values and eigenvectors. Linear ordinary differential equations of first & second order, special functions (Hermite, Bessel, Laguerre and Legendre functions). Fourier series, Fourier and Laplace transforms. Elements of complex analysis, analytic functions; Taylor & Laurent series: poles, residues and evaluation of integrals. Elementary probability theory, random variables, binomial, Poisson and normal distributions. Central limit theorem.

II. Classical Mechanics

Newton's laws. Dynamical systems, Phase space dynamics, stability analysis. Central force motions. Two body collisions-scattering in laboratory and centre of mass frames. Rigid body dynamics-moment of inertia tensor. Non-inertial frames and pseudo forces. Variational principle. Generalized coordinates.Lagrangian and Hamiltonian formalisms and equations of motion. Conservation laws and cyclic coordinates. Periodic motion: small oscillations, normal modes. Special theory of relativity-Lorentz transformations, relativistic kinematics and mass-energy equivalence.

III. Electromagnetic Theory

Electrostatics: Gauss s law and its applications, Laplace and Poisson equations, boundary value problems. Magneto statics: Biot-savart law, Ampere's theorem. Electromagnetic induction. Maxwell's equations in free space and linear isotropic media; boundary conditions on the fields at interfaces. Scalar and vector potentials, gauge invariance. Electromagnetic waves in free space. Dielectrics and conductors. Reflection and refraction, polarization, Fresnel's law, interference, coherence and diffraction. Dynamics of charged particles in static and uniform electromagnetic fields. Charges particles in inhomogeneous fields.

IV. Quantum mechanics

Wave-particle duality. Schrodinger equation (time-dependent and time-independent). Eigen value problems (particle in a box, harmonic oscillator, etc..).Tunnelling through a barrier. Wave function in coordinate and momentum representations. Commutators and Heisenberg uncertainty principle. Dirac notation for state vectors. Motion in a central potential: Orbital angular momentum, angular momentum algebra, spin, addition of angular momenta; Hydrogen atom. Stem-Gerlach experiment. Time independent perturbation theory and applications. Variational method. Time dependent perturbation theory and Fermi's golden rule.Selactin rules. Identical practices. Pauli exclusion principle.spin-statistics connection.

V. Thermodynamics and statistical Physics

Laws of thermodynamics and their significance. Thermodynamic potentials, Maxwell relations, chemical potential, Phase equilibrium. Phase space. Micro and macro- states. Micro-canonical, canonical and grand-canonical ensembles and partition functions. Free energy and its connection with thermodynamic quantities. Classical and quantum statistics. Bose and Fermi gases. Principle of detailed balance. Black body radiation and Planck's distribution law

VI. Electronics

Semiconductor devices (diodes, junctions, transistors, field effect devices, homo- and hetero junction devices), device structure, device characteristics, frequency dependence and applications. Opto-electronic devices (solar cells, photo detectors, LEDs). Rectifiers and power supplies. Feedback amplifiers and their frequency response. Oscillators, Multivibrators. Operational amplifiers and their applications, Digital techniques and applications (Logic circuits, registers, counters and Comparators). A/D and D/A converters. Microprocessors, micro controller basics. Fundamentals of AM communication, FM communication and Fibre optic communication and their techniques.

VII. Atomic & Molecular Physics

Quantum States of an electron in an atom. Electron spin. Spectrum of Helium and alkali atom. Relativistic corrections for energy levels of hydrogen atom, hyper fine structure and isotopic shift, width of spectrum lines, LS &JJ couplings. Zeeman, Paschen-Bach & Stark effects. Frank-condon principle. Electronic rotational, vibrational and Raman spectra of diatomic molecules. Selection rules. Lasers: spontaneous and stimulated emission, Einstein A & B coefficients. Optical pumping, Population inversion, rate equation. Modes of resonators and coherence length.

VIII. Condensed Matter Physics

Bravais lattice. Reciprocal lattice. Diffraction and the structure factor. Bonding of solids. Elastic properties, Phonons, lattice specific heat. Free electron theory and electronic specific heat. Response and Relaxation phenomena. Drude model of electrical and thermal conductivity. Hall Effect and thermoelectric power. Electron motion in a periodic potential, band theory of solids; metals, insulators and semiconductors. Super conductivity: Type-I and type-II super conductors. Josephson junctions. Superfluidity. Defects and dislocations. Ordered phases of matter: translational and orientation order, kinds of liquid crystalline order. Quasi crystals.

IX. Nuclear and Particle Physics

Basics of radio activity. Basic nuclear properties; size, shape and charge distribution, spin and parity. Binding energy, Semi-empirical mass formula, liquid drop model. Nature of the nuclear force, form of nucleon-nucleon potential, charge –independence and charge symmetry of nuclear forces. Deuteron problem. Evidence of shell structure, single-particle shell model, its validity and limitations. Elementary ideas of alpha, beta and gamma decays and their selection rules. Fission and fusion. Nuclear reactions. Reaction mechanism, compound nuclei and direct reactions.

PAPER-II: CHEMISTRY

Inorganic Chemistry:

1. Atomic structure and chemical bonding – structure and bonding in homo and hetero nuclear molecules. Application of VSEPR, Valence Bond and Molecular orbital theories in explaining the structures of simple molecules.
2. Chemistry of main group (I to VII & Nobel gases) elements.
3. Chemistry of transition elements and inner transition elements.
4. General principles of metallurgy: Occurrence of metals , Concentration of ores - levigation, magnetic separation, froth floatation, leaching , Extraction of crude metal from concentrated ore-conversion to oxide, reduction of oxide to the metal , Thermodynamic principles of metallurgy-Ellingham diagramlimitations, applications. Extraction of iron, copper and zinc from their oxides, Electrochemical principles of metallurgy, Oxidation and reduction, Refining of crude metal-distillation, liquation poling, electrolysis, zone refining and vapour phase refining, Uses of aluminium, copper, zinc and iron. Alloys: Inter-metallic compounds
5. Coordination Chemistry –IUPAC nomenclature, bonding theories – Werner's theory, EAN rule, VBT, Crystal Field Theory – Crystal Field splitting patterns in various geometries, Factors affecting on CFT. Calculation of CFSE – John Teller effect – Isomerism in complexes. Spectral and magnetic properties of Coordination complexes – Russell Sanders coupling – term symbols - charge transfer spectra of complexes.
6. Stability of metal complexes – Stepwise and overall stability constants – Factors affecting the stability of metal complexes - Chelate effect. Pearson's theory of hard and soft acids and bases (HSAB).
7. Reaction mechanism of metal complexes–Inert and labile complexes – Ligand substitution reaction of octahedral complexes – Acid hydrolysis, Base hydrolysis – Conjugate base mechanism – Anation reactions – Substitution reactions of square planar complexes – Trans effect – Electron transfer reactions – Inner and outer sphere mechanisms.
8. Metal carbonyls, Nitrosyls and Metallocenes - Structure and bonding.
9. Bio-inorganic chemistry- Metal complexes as oxygen carriers-Hemoglobin and myoglobin-Oxygen transport – Non heme proteins – Hemerythrin and hemocyanin.
10. Analytical chemistry- Chromatography – General principles involved in separations by Paper, Thin layer, Column Chromatography, GC and HPLC.

Physical Chemistry:

11. Solutions and colligative properties: Types of solutions, Expressing concentration of solutions mass percentage, volume percentage, mass by volume percentage, parts per million, mole fraction, molarity and molality, Solubility: Solubility of a solid in a liquid, solubility of a gas in a liquid, Henry's law, Vapour pressure of liquid solutions: vapour pressure of liquid- liquid solutions. Raoult's law as a special case of Henry's law -vapour pressure of solutions of solids in liquids, Ideal and non-ideal solutions, Colligative properties and determination of molar mass - Relative lowering of vapour pressure, elevation of boiling point, Depression of freezing point, Osmosis and osmotic pressure-reverse osmosis and water purification. Abnormal molar masses - van't Hoff factor. Phase equilibria– Phase rule and its application to one component and two component systems
12. Acids and bases: Acids, bases and salts- Arrhenius, Bronsted-Lowry and Lewis concepts of acids and bases. Ionisation of Acids and Bases –Ionisation constant of water and it's ionic product- pH scaleionisation constant of weak acids and weak bases-relation between Ka and Kb. Di and poly basic acids and di and poly acidic Bases-Factors affecting acid strength-Common ion effect in the ionization of acids and bases-Hydrolysis of salts and pH of their solutions. Buffer solutions.
13. Thermodynamics: Brief review of concepts of I and II laws of thermodynamics. Concept of entropy. Entropy as a state function. Calculation of entropy changes in various processes. Entropy changes in an ideal gas. Entropy changes on mixing of ideal gases. Entropy as a function of V and T. Entropy as a function of P and T. Entropy change in isolated systems- Clausius inequality. Entropy change as criterion for spontaneity and equilibrium. Third law of thermodynamics. Evaluation of absolute entropies from heat capacity data for solids, liquids and gases. Standard entropies and entropy changes of chemical reactions. Helmholtz and Gibbs free energies (A

and G). A and G as criteria for equilibrium and spontaneity. Physical significance of A and G. Driving force for chemical reactions- relative signs of ?H and ?S. Thermodynamic relations. Gibbs equations. Maxwell relations. Temperature dependence of G. Gibbs- Helmholtz equation. Pressure dependence of G. Chemical potential: Gibbs equations for non-equilibrium systems. Material equilibrium. Phase equilibrium. Clapeyron equation and Clausius-Clapeyron equation. Conditions for equilibrium in a closed system. Chemical potential of ideal gases. Ideal-gas reaction equlibrium-derivation of equilibrium constant. Temperature dependence of equilibrium constant - The Van't hoff equation.

14. Electrochemistry: Conductance and its applications, Derivation of Nernst equation. Chemical and concentration cells (with and without transference). Liquid junction potential – derivation of the expression for L J P – its determination and elimination. Applications of EMF measurements: Solubility product, potentiometric titrations, determination of transport numbers, equilibrium constant measurements. Decomposition potential and its significance. Electrode polarization – its causes and elimination. Concentration over potential. Concept of activity and activity coefficients in electrolytic solutions. The mean ionic activity coefficient. Debye-Huckel theory of electrolytic solutions. Debye-Huckel limiting law. Calculation of mean ionic activity coefficient. Limitations of Debye-Huckel theory. Extended Debye-Huckel law. Theory of electrolytic conductance. Derivation of Debye-Huckel-Onsager equation – its validity and limitations. Concept of ion association – Bjerrum theory of ion association (elementary treatment) - ion association constant – Debye-Huckel-Bjerrum equation.

15. Quantum chemistry: Black body radiation-Planck's concept of quantization-Planck's equation, average energy of an oscillator. Wave particle duality and uncertainty principle - significance for microscopic entities. Emergence of quantum mechanics. Wave mechanics and Schrödinger wave equation. Operators - operator algebra: Commutation of operators, linear operators, Complex functions, Hermitian operators. Operators and. Eigen functions and Eigen values. Degeneracy. Linear combination of Eigen functions of an operator. Well behaved functions. Normalized and orthogonal functions. Postulates of quantum mechanics. Physical interpretation of wave function. Observables and operators. Measurability of operators. Average values of observables. The time dependent Schrodinger equation. Separation of variables and the time-independent Schrodinger equation.

16. Chemical kinetics: Theories of reaction rates - Collision theory, Transition state theory, Reaction coordinate, activated complex and the transition state. Thermodynamic formulation of transition state theory. Unimolecular reactions and Lindeman's theory.

17. Photochemistry: Electronic transitions in molecules - The Franck Condon principle. Electronically excited molecules- singlet and triplet states. Radiative life times of excited states-theoretical treatment. Measured lifetimes. Quantum yield and its determination. Actinometry - ferrioxalate and uranyl oxalate actinometers. Derivation of fluorescence and phosphorescence quantum yields. E-type delayed fluorescence-evaluation of triplet energy splitting (?EST). Laws of photo chemistry, Photo physical processes, photo physical kinetics of unimolecular reactions. Calculation of rate constants of various photo physical processes, State diagrams, photochemical primary processes. Types of photochemical reactions- electron transfer, photo dissociation, addition, abstraction, oxidation and isomerisation reactions with examples. Effect of light intensity on the rates of photochemical reactions. Photosensitization. Quenching-Stern Volmer equation. Experimental set up of a photochemical reaction. Introduction to fast reactions- Principles of flash photolysis.

18. Solid state chemistry: General characteristics of solid state. Classification of crystalline solids based on different binding forces, probing the structure of solids: X-ray crystallography, Crystal lattices and unit cells. Bravais lattices- primitive and centred unit cells, Number of atoms in a unit cell (primitive, body centred and face centred cubic unit cell), Close packed structures: Close packing in one dimension, in two dimensions and in three dimensions- tetrahedral and octahedral voids- formula of a compound and number of voids filled- locating tetrahedral and octahedral voids, Packing efficiency in simple cubic, bcc and in hcp, ccp lattice. Calculations involving unit cell dimensions density of the unit cell. Imperfections in solids-types of point defects-stoichiometric and non-stoichiometric defects. Magnetic properties of solids- classification of magnetic materials, Magnetic susceptibility, Langevin diamagnetism, Weiss theory of para magnetism. Magnetic properties of solids - classification of magnetic materials, Magnetic susceptibility, Langevin diamagnetism, Weiss theory of para magnetism Electronic properties of metals, insulators and semi conductors: Electronic structure of solids, Band theory, band structure of metals, insulators and semiconductors. Electrons holes and

excitons. The temperature dependence of conductivity of extrinsic semi conductors. Photo conductivity and photovoltaic effect.

Organic Chemistry:

19. IUPAC nomenclature of organic molecules. Isomerism – classification of isomers.
20. Classification, preparations and properties of alkane, alkenes, alkynes, cyclo alkanes, aromatic hydrocarbons, halogen compounds, hydroxy compounds, carbonyl compounds, carboxylic acids and its derivatives.
21. Stereo chemistry: Molecular representations (Wedge, Fisher, Newman and Saw-horse projection formula) their description and interconversions. Stereoisomers – lassification-configuration- R,S- Nomenclature, criteria for chirality, Axial chirality of allenes, spiranes, alkylidenes, Cycloalkanes, chiral biaryls - Atropisomerism. Planar chirality of ansa compounds and trans- cyclooctene. Helical chiral compounds. Determination of absolute configuration by chemical correlation methods. Determination of configuration in E,Z- nomenclature. Spectral and chemical methods for determination of E, Zconfiguration, including aldoxime and ketoximes.
22. Introduction to conformational isomerism, Klyne - Prelog terminology for conformers and torsion angles, dihedral angle, Steric strain and the concept of dynamic stereoisomerism. Study of conformations of acyclic compounds like ethane, butane, dihalobutanes, halohydrin, ethylene glycol, butane-2, 3-diol, amino alcohols and 1,1,2,2-tetrahalobutanes.
23. Nature of bonding in organic molecules and aromaticity, delocalized chemical bonding, conjugation, cross conjugation, resonance, hyperconjugation, tautomerism, Huckel's Rule and the concept of aromaticity-Aromaticity, non-aromaticity and anti aromaticity.
24. Reactive intermediate: Generation, detection, structure, stability and reactivity of carbocation, carbanion, free radical, carbene and nitrene. Molecular rearrangements: definition and classification, molecular rearrangements involving 1). Electron deficient carbon: Wagner - Meerwein, Pinacol-Pinacolone, allylic and Wolf rearrangement. 2). Electron deficient Nitrogen: Hofmann, Lossen, Curtius, Schmidt and Beckmann rearrangements. 3) Electron deficient Oxygen: Baeyer-Villiger oxidation. 4). Base catalysed rearrangements: Benzylic acid, Favourski, Tran annular, Sommlett-Hauser and Smile rearrangement.
25. Organic reaction mechanism: Mechanism, stereochemistry and energy profile diagram of Addition reactions to polar and non polar double bonds. Substitution reactions: Mechanism, rate law, stereochemistry and factors affecting on aliphatic and aromatic reactions. Elimination reactions- mechanism, rate law, stereochemistry, orientation and factors affecting on E1, E2, E1CB, pyrolyticsyn elimination and a-elimination, elimination vs substitution. Detection of reaction mechanism by product isolation, isotopic labelling, chemical trapping and crossover experiments.
26. Oxidation- Swern, Cr (VI) oxidants, Oxidative cleavage of 1,2-diols - Periodic acid and Lead tetra acetate.

    Reductions - Wilkinsons's catalytic hydrogenation, LiAlH4, NaBH4, BH3, AlH3 and DIBAL.
27. Heterocyclic chemistry: importance as drugs, nomenclature, classification based on size of the ring, number and nature of hetero atoms. Synthesis and reactivity of Pyrrole, furan, Thiophene, pyridine, Indole, Benzothiophene, Quinoline, Isoqunolines.
28. Alkaloids and Terpenoids- importance as drugs, isolation of natural products by steam distillation, solvent extraction and chemical methods. Structure determination and synthesis of papverine, nicotine and quinine. General methods in the structure determination of Terpenes, isoprene rule, special isoprene rule, structure determination of a-Terpeniol and camphor.
29. Organic photochemistry: photochemical energy, Frank-Condon principle, Jablonski diagram, Electronic transitions, photosensitization, quenching, quantum efficiency, quantum yield, photochemistry of carbonyl compounds n?p* and p?p* transitions. Norrish type-I and Norrish type-II cleavages. Paterno-Buchi reactions, Photoreduction, photochemistry of enones- hydrogen abstraction, rearrangements of a,ß-unsaturated ketones and cyclohexadienones, photochemistry of pbenzoquinones, Dienes - photochemistry of 1,3- butadiene, (2+2) additions, Di-p-methane rearrangement, photochemistry of aromatic compounds, excited states of benzene and its 1,2-, 1,4- additions.
30. Pericyclic reactions: Classification, Stereochemistry of pericyclic reactions, Molecular Orbitals and Symmetry of ethelene, 1,3-butadiene, 1,3,5-hexatriene, allylic, 1,3-pentadienyl and 1,3,5-heptatrienyl p- systems. Analysis of pericyclic reactions by PMO, FMO and orbital correlation methods.

31. Basic principles, concepts of UV, IR, H1NMR, C13NMR and Mass spectroscopic methods – structure determination of organic compounds by UV, IR, H1NMR, C13NMR and Mass spectroscopic methods.
32. Green chemistry: Principles of Green chemistry, and its approaches.

PAPER-II: COMMERCIAL AND COMPUTER PRACTICE

(To teach Commerce and English Type writing & Shorthand Subject)

01. FINANCIAL MANAGEMENT:

Corporation Finance – Economic and Managerial Aspects – Finance Education.

Financial Plan – Operating and Financial leverage – Capital Structure determinants.

Internal Financial Control – Ratio Analysis – Break-even Analysis – Sources and uses of funds statements.

Concepts of valuation and cost of capital – Cost of Debt - Cost of preference capital – Cost of Equity Capital – Cost of retained earnings – Weighted Cost of Capital.

Fundamentals of capital Budgeting – Evaluation of Investment opportunities – Pay back Accounting, Rate of Return – Discounted cash flow Techniques.

Concepts of over and under capitalisation – Working Capital management – Management of Inventories. Receivables and Cash.

Economics and Income retention – divided policy. Financial Aspects of expansion, reconstruction and recognition.

02. INDUSTRIAL ORGANISATION:

Concepts of Industry, Firm and Plant.

Size of Units – Optimum firm and representation firm – Size in Private and Public Sectors in India – Problems and Policy implications – Multi-Plant Units – Multi-Plant Units in Private and Public Sectors – Economic Problems and Policy Size and efficiency.

Location – Concepts of Location and Localisation – Location criteria – Factors influencing Localisation – Measures of Localisation – Localisation pattern in Indian Industry – Balanced Regional Development – Location development of managers – Performance Appraisal.

State and Industry – Operational Control over Private Industry.

03. LABOUR ECONOMICS AND INDUSTRIAL RELATIONS:

Labour in Industrial Society – Man Power Problems of under developed countries.

Economics of the Labour Market – Factors affecting supply and demand for labour – Concepts of full employment, unemployment – Different types of unemployment – Causes – effects and remedial measures, labour mobility – Absenteeism and turnover.

Social security and Labour Welfare – Problems of Social Security in a developing economy – Social Security in India. Settlement of Industrial Disputes – Machinery for the same.

Collective bargaining – Objectives and methods – Issues in Bargaining.

Tripartite bodies in Industrial Relations.

04. MANAGEMENT:

Organisation Concept – Different approaches to the study of Organisation. Constraints over organisational and managerial Performance. Principles of Organisation.

Planning – Business Objectives – Social responsibilities of business.

Authority, Power, Influence and the art of delegation. Span of Supervision.

Line and Staff relationships.

Bases and problems of departmentation.

Centralisation and Decentralisation.

Bureaucracy – Committee Management.

Top management functions and the role of the Board.

Control functions in organisations.

Group dynamics.

Communication – Leader ship – Motivation – Morale – Training and Development of Managers – Performance appraisal.

PAPER-II: COMMERCIAL AND COMPUTER PRACTICE

(To teach Computer Practice)

1. **Financial Management:** Meaning, nature, objectives and scope of financial management. Capital budgeting, process, techniques. Sources of finance. Cost of capital – cost of various sources of finances. Leverages – operating and financial leverages. Capital structure theories. Working capital management – cash, receivables and inventory management.
2. **Financial and management accounting:** Techniques of analysis of financial statements – comparative and common size statements, trend analysis and ratio analysis. Funds flow and cash flow analyses.
3. **Managerial Economics:** Meaning, nature and scope of managerial economics. Demand analysis. Production and cost analysis. Market structure – perfect and imperfect markets.
4. **Business environment:** Meaning and components of business environment. Industrial policies, and 1991. Liberalization privatization and globalization. WTO.
5. **Marketing management:** Meaning, concepts, nature and scope of marketing management – marketing environment. Consumer behaviour and market segmentation. Product, price, promotion and Channel management.
6. **Quantitative techniques:** Sampling and sampling methods. Probability and probability distributions – hypothesis testing. Parametric tests (Z, t – tests and ANOVA) and non-parametric tests (Chi – square tests).
7. **Business Mathematics :** Simple and Compound Interest, Calculating value of annuities, Functions and graphs, Limits and differentiation, Basic Matrix operations , Basics of Linear Programming.
8. **Computer tools for office applications:** Basic knowledge of computers and its peripheral equipment, Use of word processing (such as MS Word) and spreadsheet management (such as MS Excel) software. Use of internet and email for office correspondence. Use of accounting packages (such as Tally).

PAPER-II: ELECTRONICS AND COMMUNICATION ENGINEERING

Section-I Networks:

1. **Network graphs**: matrices associated with graphs; incidence, fundamental cut set and fundamental circuit matrices. Solution methods: nodal and mesh analysis.
2. **Network theorems**: superposition, Thevenin's and Norton's maximum power transfer, Wye-Delta transformation. Steady state sinusoidal analysis using phasors. Linear constant coefficient differential equations; time domain analysis of simple RLC circuits,
3. **Solution of network equations using Laplace transform**: frequency domain analysis of RLC circuits. 2-port network parameters: driving point and transfer functions. State equations for networks.
4. **Electronic Devices:** Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, P- I -N and avalanche photo diode, Basics of LASERs.
5. **Device technology**: integrated circuits fabrication process, oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twin-tub CMOS process.
6. **Analog Circuits:** Small Signal Equivalent circuits of diodes, BJTs, MOSFETs and analog CMOS. Simple diode circuits, clipping, clamping, rectifier. Biasing and bias stability of transistor and FET amplifiers.
7. **Amplifiers**: single-and multi-stage, differential and operational, feedback, and power. Frequency response of amplifiers. Simple op-amp circuits. Filters. Sinusoidal oscillators; criterion for oscillation; single-transistor and op-amp configurations. Function generators and wave-shaping circuits, 555 Timers. Power supplies.

Section-II

1. **Digital circuits:** Boolean algebra, minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS).
2. **Combinatorial circuits**: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs.
3. **Sequential circuits**: latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs. Semiconductor memories.
4. **Microprocessor (8085):** architecture, programming, memory and I/O interfacing.
5. **Signals and Systems:** Definitions and properties of Laplace transform continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, and FFT, z-transform. Sampling theorem.
6. **Linear Time-Invariant (LTI) Systems**: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay. Signal transmission through LTI systems.
7. **Control Systems:** Basic control system components; block diagrammatic description, reduction of block diagrams. Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control systems and frequency response.
8. **Tools and techniques for LTI control system analysis**: root loci, Routh-Hurwitz criterion, Bode and Nyquist plots.
9. **Control system compensators**: elements of lead and lag compensation, elements of Proportional-Integral-Derivative (PID) control. State variable representation and solution of state equation of LTI control systems.

Section-III

1. **Communications:** Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density.
2. **Analog communication systems:** amplitude and angle modulation and demodulation systems, spectral analysis of these operations, superheterodyne receivers; elements of hardware, realizations of analog communication systems; signal-to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions. Fundamentals of information theory and channel capacity theorem.
3. **Digital communication systems**: pulse code modulation (PCM), differential pulse code modulation (DPCM),
4. **Digital modulation schemes:** amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. Basics of TDMA, FDMA and CDMA and GSM.
5. **Electromagnetics:** Elements of vector calculus: divergence and curl; Gauss' and Stokes' theorems,
6. **Maxwell's equations**: differential and integral forms. Wave equation, Poynting vector.
7. **Plane waves**: propagation through various media; reflection and refraction; phase and group velocity; skin depth.
8. **Transmission lines**: characteristic impedance; impedance transformation; Smith chart; impedance matching; S parameters, pulse excitation.
9. **Waveguides**: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide and optical fibers.
10. **Basics of Antennas:** Dipole antennas; radiation pattern; antenna gain.

PAPER-II: MECHANICALENGINEERING

Section I:AppliedMechanics andDesign

1. **Engineering Mechanics:** Free-body diagrams and equilibrium; trusses and frames; virtual work; kinematics and dynamics of particles and ofrigidbodies in plane motion; impulse and momentum (linearand angular) and energy formulations, collisions.
2. **Mechanics of Materials :** Stress and strain, elastic constants, Poisson's ratio; Mohr's circle for planes tress and planes train; thin cylinders; shear force and bending moment diagrams; bending and shears tresses; deflection of beams; torsion of circular shafts; Euler's theory of columns; energy methods; thermal stresses; strain gauges and rosettes; testing of materials with universal testing machine; testing of hardness and impact strength.
3. **Theory of Machines:** Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of linkages; cams; gears and gear trains; flywheels and governors; balancing of reciprocating and rotating masses; gyroscope.
4. **Vibrations:** Free and forced vibration of single degree of freedom systems, effect of damping; vibration isolation; resonance; critical speeds of shafts.
5. **Machine Design:** Design for static and dynamic loading; failure theories; fatigue strength and the S-Ndiagram; principles of the design of machine elements such as bolted, riveted and welded joints, keys, shafts, gears, rolling and sliding contact bearings, brakes and clutches, springs.

Section II: Fluid Mechanics and Thermal Sciences

1. **Fluid Mechanics :**Fluid properties; fluid statics, manometry, buoyancy, forces on submerged bodies, stability of floating bodies; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; dimensional analysis; viscous flow of incompressiblefluids,boundarylayer,elementaryturbulentflow,flowthroughpipes, head losses in pipes, bend sand fittings.
2. **Heat-Transfer :** Modes of heat transfer ;one dimensional heat conduction ,resistance concept and electrical analogy, heat transfer through fins; unsteady heat conduction ,lumped parameter system ,thermal boundary layer, dimensionless parameters in free and forced convective heat transfer, heat transfer correlations for flow over flat plates and through pipes ,effect of turbulence; heat exchanger performance, LMTD and NTU methods; radiative heat transfer, Stefan- Boltzmann law, Wien'sdis placement law, black and grey surfaces ,view factors, radiation network analysis.
3. **Thermodynamics:** Thermodynamic systems and processes; properties of pure substances, behavior of ideal and real gases; zeroth and first laws of thermodynamics, calculation of work and heat in various processes ; second law of thermodynamics; availability and irreversibility; thermodynamic relations.
4. **Power Engineering**: Air compressors; vapour and gas power cycles, concepts of regeneration and reheat.
5. **I.C.Engines**: Air-standard Otto, Diesel and dual cycles.
6. **Refrigeration and air-conditioning:** Vapour and gas refrigeration and heat pump cycles; basic psychro metric processes.
7. **Turbomachinery:** Impulse and reaction principles, velocity diagrams, Pelton-wheel, Francis and Kaplan turbines.

Section III: Materials, Manufacturing and Industrial Engineering

1. **Engineering Materials**: Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.
2. **Casting, Forming and Joining Processes:** Different types of castings, design of patterns ,moulds and cores; solidification and cooling; riser and gating design. Plastic deformation and yield criteria; fundamental sofhot and coldworking processes; load estimation for bulk metal forming processes such as forging, rolling, extrusion, drawing; and sheet metal forming processes such as shearing, deep drawing, bending; principles of powder metallurgy .Principles of welding ,brazing ,soldering and adhesive bonding.

3. **Machining and Machine Tool Operations:** Mechanics of machining; basic machine tools; single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, design of jigs and fixtures.
4. **Metrology and Inspection:** Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; form and surface finish measurement; machine tool alignment and testing methods ;tolerance analysis in manufacturing and assembly.
5. **Computer Integrated Manufacturing:** Basic concepts of CAD/CAM and their integration tools.
6. **Production Planning and Control:** Forecasting models, aggregate production planning , scheduling, materials requirement planning.
7. **Inventory Control:** Deterministic models; safety stock inventorycontrolsystems.
8. **Operations Research:** Linear programming, simplex method transportation, assignment, networkflowmodels ,simplequeuingmodels, PERT and CPM.

PAPER-II: ELECTRONICS AND INSTRUMENTATION ENGINEERING

1. **FUNDAMENTALS:** Coulomb's law – Ohms law – Faraday's laws of Electromagnetic Induction, Kirchhoff's laws, Ampere's law Resistance, Capacitance and Inductance.

2. **ELECTRONIC CIRCUITS:** Graph, tree and links – Loop currents, node voltages two port net works, Z, Y and Hybrid parameters. Alternating currents, RMS value, form factor, R.L.C. in AC Circuits power; and power factor, network theorems – Harmonic analysis.

3. **ELECTRONIC CIRCUITS:** Logic circuits – Universal gates, Booleans functions and their realization – Product of sums and sums of product forms – Combinational circuits – Sequential circuits, SR and JK flip flops, Series and parallel Counters and Registers.

4. **ELECTRICAL MEASUREMENTS:** Indicating instruments, D'Arsonval type Galvanometer, Vibration Galvanometer, Ballistic Galvanometer, Measurement of resistance, DC & AC Potentiometers, Wheatstone Bridge, Kelvin's bridge, AC Bridges, Maxwell's, Andunar, Heaviside and Schering bridges.

5. **ELECTRONIC INSTRUMENTS:** Cathode Ray Oscilloscope and its applications, Electronic Voltmeters – Balanced bridge type, transistor Voltmeter, Chopper amplifier type Voltmeter, High Frequency measurements.

6. **INSTRUMENTATION:** Transducers – Primary and Secondary – Classification of transducers, Potentiometers as displacement transducers, strain gauges, Induction and capacitive transducers, LVDT, Rotary variable differential transformer, Piezoelectric transducer, Digital Voltmeters, Digital frequency meters, measurement of displacement, strain gauge circuits, measurement of pressure, Measurement of Velocity, measurement of temperature and measurement of flow.

PAPER-II: CIVIL ENGINEERING

1. Building Materials And Construction:

Bricks– Types of Bricks, Indian standard classification, properties; Stones – Types of stones, classification, properties, dressing and polishing of stones; Methods of Quarrying; Cement – Different grades and types of cement, properties and IS specifications; Aggregates – coarse and fine aggregate, properties and IS specifications; Cement Mortar – Proportions of cement mortar for various applications; Concrete – Constituents of Concrete, Different grades of Concrete, mix proportioning using IS Code, Properties of fresh and hardened Concrete; Admixtures – Types of Admixtures

2. Strength of Materials And Theory of Structures:

Strength of Materials: Simple stresses and strains, elastic constants and relationship between them; Compound bars; Temperature stresses; Shear forces and bending moment diagrams for beams; Principal stresses and Mohr's circle of stress, Theory of bending and bending stresses ; Shear stress distribution; Theory of torsion; Springs; Deflections of beams; Thin and thick cylinders;; Analysis of trusses, Betti-Maxwell theorem; Shear centre and unsymmetrical bending.
Theory of Structures: Direct and bending stresses; Columns and struts; Strain energy method; Moving loads and influence lines; Arches and suspension bridges; Static and kinematic indeterminacy; Moment distribution, Slope deflection, and Kani's methods applied to continuous beams and portal frames; Column analogy and matrix methods of analysis.

3. RCC and Steel Structures:

Concrete Structures: Materials, permissible stresses and IS Specifications; Working stress methods; Limit State Method - Stress Blocks parameters, design of Beams, Slabs, Columns and Footing; Design for Shear and Torsion; Design of Retaining Walls, Water tanks, and T-Beam Slab bridges; Yield line theory.
Steel Structures: Properties of steel sections, permissible stresses, IS Specifications; Riveted and welded joints and connections; Design of simple and compound Beams and Columns, Column bases, Roof trusses, Plate and Gantry Girders; Plate Girder Lattice Girder Railway bridges, and Bearings. Plastic analysis.
Pre-Stressed Concrete: Basic concepts, material for pre-stressing, losses in Pre-stress, classification of pre-stressing system; Analysis of PSC Sections.

4. Fluid Mechanics and Hydraulics:

Fluid Properties; Measurement of Pressure - Manometers; Fluid Kinematics – Classification of Fluids, Stream function and Velocity potential, significance and use of Flownets, Fluid dynamics - Continuity equation, Bernoulli's equations and Impulse momentum equation; Laminar and Turbulent flow through pipes – significance of Reynolds number, Hagen – Poiseuille's equation, Darcy – Weisbach equation, Friction factor, Water hammer phenomenon; Compressible flow – Bernoulli's equation for Isothermal and Adiabatic conditions, Mach Number, Mach cone, stagnation properties; Steady uniform flow through open channels; Gradually varied flows – significance of Froude number, classification and computation of Flow profiles, Hydraulic jump, Surges; Boundary layer – Laminar and Turbulent Boundary layer, Boundary layer thickness, rough and smooth Boundaries, Boundary layer separation; Dimensional analysis and similarity laws; Hydraulic Turbines – classification, Velocity triangles, principles and design of reaction and impulse turbines; Centrifugal pumps – specific speed, work done and efficiency, characteristic curves.

5. Hydrology and Water Resources Engineering:

Hydrological cycle; Rainfall – types and measurement, network design; Infiltration - Φ-index; Runoff – process, factors and determination of runoff, dependable yield; Floods – flood hydrograph, computation of flood peak using rational formula, unit hydrograph method and Gumbel's extreme value methods; Groundwater – types of aquifer and properties, Darcy's law, specific yield, steady radial flow to wells in confined and unconfined aquifers; Irrigation – types and advantages, soil water plant relationship, consumptive use, duty, delta, base period, crops and their water requirements; Single and multipurpose projects; Dams – classification, forces and design of Gravity dam and Earth dam; Spillways – types, energy dissipation, stilling basin, Appurtenances; Canals – alignment, Kennedy's and Lacey's theories, lining of Canals; Weirs – components, design of vertical drop and sloping glacis weir; Seepage forces – Bligh's Theory, Khosla's theory; Canal falls – types and design principles; Cross drainage works – classification and design principles of aqueducts; Hydropower – classification and principle components of Hydroelectric power plants.

6. Environmental Engineering:

Water supply – objectives, rate of demand, population forecasts; Analysis of water – classification, design of coagulation, sedimentation, filtration, disinfection and softening processes; Methods of layout of distribution pipes – Hardy cross method; Waste water engineering – systems of sewerage, hydraulic formulae and design of sewers, BOD, COD, self purification of natural streams, methods of sewage disposal; Treatment of sewage – principles and design of grit chamber, sedimentation tanks, trickling filters, activated sludge process, sludge digestion tanks, septic tanks; Municipal solid waste – characteristics, collection and transportation of solid wastes; Air Pollution – types and sources of pollutants, air quality standards; Noise pollution – Impacts and permissible limits, measurement and control of noise pollution.

7. Transportation Engineering:

Highway Classification as per IRC; Highway alignment; Engineering Surveys; Geometric Design; Cross sectional elements of road; Gradient; Grade compensation; Traffic Surveys – speed, Volumes, origin and destination; Highway capacity and level of service as per HCM 2000; Intersection – at grade and grade separated; Channelization; Rotary intersection; signal design – webstar method, traffic signs, pavement marking; Parking studies, accidentalstudies, pavement types, Factors considered for pavement design, flexible and rigid pavements design concepts.
Railway Engineering: Permanent way, rails, sleepers, ballast; Creep, coning of wheel, rail fixtures and fastenings, super elevation, cant deficiency, curves, turnout; Points and crossings.
Airport Engineering: Selection of site of Airport, runway orientation and design, wind rose diagram, basic run way length, correction to basic runway length.

8. Soil Mechanics and Foundation Engineering:

Soil Mechanics: Physical properties of soils, Classification and identification, Permeability, Capillarity, Seepage, Compaction, Consolidation, Shear Strength, Earth pressure, Slope stability;
Foundation Engineering: Site investigations, stress distribution in soils, Bearing capacity, Settlement analysis, Types of Foundation, Pile foundations, Foundations on expansive soils; swelling and its preventions; Coffer dams, Caissons, Dewatering, Bracing for excavations, Newmark charts, machine foundations.
Engineering Geology: Mineralogy, Structural Geology, Groundwater Exploration methods; Engineering Geology applications for Tunnels, Dams and Reservoirs; Geological hazards and preventive measures.

9. Estimation, Costing and Construction Management:

Abstract estimate: Detailed estimate – centerline, long & short wall method, various items of Civil Engineering works as per Indian Standard, General Specifications - Earth Work, Brick / Stone Masonry in Cement Mortar, RCC, Plastering in Cement Mortar, Floor finishes, white wash, colour wash; Standard schedule of rates, lead and lift, preparation of lead statement; Computation of earth work – Mid-ordinate, Mean Sectional area, Trepezoidal method, Prismoidal Rule; Approximate estimate – Plinth area and cubic rate estimate.

10. Surveying:

Principle and classification of surveying, chain surveying; Compass surveying; Levelling and contouring; Theodolite surveying; curves; Introduction and Fundamental concepts of electronic measuring instruments – EDM, Total station, GIS & GPS.

PAPER-II: METALLURGICAL AND MATERIAL ENGINEERING

PHYSICAL METALLURGY:

Crystal structure and bonding characteristics of metals.
Solid solutions, Constitution of Alloys,
Solidification of pure metals and alloys, constitutional super cooling.
Phase diagrams - interpretation of binary phase diagrams, zone refining.
Important phase diagrams-Fe-C, Cu-Zn, Cu-Sn, Al-Si, Al-Cu, Pb-Sn and Sb-Sn.
Effect of alloying elements on Fe-Fe_3C diagram, alloy steels and cast irons.
Industrially important non-ferrous metals and alloys - Types, properties and applications. Industrial ceramics and composites.
Diffusion and Fick's laws, mechanisms.
Metallurgical Microscope and Electron Microscopy.
Macro and Micro examination of examination of metals and alloys,
Principles of X-ray diffraction-DiffractionMethods - Applications

HEAT TREATMENT TECHNOLOGY

Principles of heat treatment - Phase transformations in steels.
Isothermal transformation diagrams, transformations on continuous cooling.
Heat treatment processes for steels, Hardenability of steels, Quenchants,
Heat treatment of plain carbon, alloy and tool steels.
Surface hardening methods and techniques,
Thermo mechanical treatments: Importance of grain size and its determination.
Heat treatment of Non-ferrous metals and alloys - Precipitation hardening.
Heat Treatment Furnaces and atmospheres. Temperature measurement and control. Defects in heat treated parts and remedies.

FUELS, FURNACES AND REFRACTORIES

Solid fuels - Classification, types and properties. Carbonization of coal, Metallurgical Coke
Liquid fuels - Classification, Petroleum refining, Distillation.
Gaseous fuels - Classification, Production, Industrial gasification processes.
Liquid and gaseous fuel burners. Combustion problems.
Furnaces - Classification and use in metallurgical industries.
Heat transfer – conduction, convection and heat transfer coefficient relations, radiation, Heat utilization and heat losses in furnaces.
Refractories - Classification, properties and testing, modes of failure and prevention, manufacturing methods, applications in the metallurgical industries.
Pyrometry - Thermoelectric pyrometry - resistance thermometers. Optical pyrometers - Total radiation pyrometers and Temperature controllers.

METALLURGICAL THERMODYNAMICS & KINETICS

Basic concepts in thermodynamics. Laws of thermodynamics.
Entropy. Free energy functions. Maxwell's relations.
Fugacity, activity and equilibrium constant. Vant Hoff's isotherm.
Phase equilibria – Clausius - Clapeyron equation. Ellingham diagrams and applications.
Thermodynamic solutions. Gibbs Duhem equation. Excess thermodynamic properties.
Kinetics of Metallurgical reactions - Laws, Order of reactions, rate constants.
Thermodynamics of Electrochemical cells.- Electrode potential, polarizations,
Reversible cells, Galvanic cells, Nernst equation.
Aqueous corrosion and protection of metals,
Oxidation and high temperature corrosion – characterization and control;

PRINCIPLES OF EXTRACTIVE METALLURGY

Minerals of economic importance. Unit processes in extractive metallurgy.
Mineral beneficiation - Comminution techniques, Concept of liberation
Size classification, Laboratory sizing units. Equipment used in industry. Screening Sedimentation.
Principles of flotation. Stokes and Newton laws. Free and hindered settling Differential flotation. Flotation circuits. Applications in mineral dressing
Heavy media separation, Tabling. Jigging. Magnetic and Electro static separation
Methods of extraction and refining of metals
Agglomeration, pyro- hydro- and electro-metallurgical processes;
Pyrometallurgy - Calcination, Roasting, Smelting, Metallothermic reduction
Material and energy balances.

IRON AND STEEL MAKING

Iron making - Raw materials, Occurrence and distribution of iron ores in India. Beneficiation of iron ores and agglomeration techniques.

Blast furnace profile and designs, Blast furnace and accessories - Stoves, Gas cleaning system. Charging system. Refractories. Burden Distribution. Physical chemistry. Blast furnace slag, Blast furnace operation and control, irregularities and corrections. Modern developments in blast furnace practice.
Alternate routes of production of pig iron. Production of sponge iron,
Production of wrought iron.
Principles of Steel making.
Pneumatic steel making process. Bessemer process, OHF, Developments in converter steel making process: LD, LD-AC, Kaldo, Rotor, Q-BOP processes.
Electric furnace steel making. Manufacture of alloy steels. Production of Ferro alloys, Continuous steel making process - BISRA, IRSID & WORCA Process.
Teeming Practices, Ingot moulds, Secondary steel making processes.
Vacuum degassing, Continuous casting of steel.

NON-FERROUS EXTRACTIVE METALLURGY
Non-ferrous mineral wealth of India.
General Methods of Extraction and refining,
Extraction of metals from oxide ores – Aluminum, Magnesium,
Extraction of metals from sulphide ores – Copper, Zinc, Lead and Nickel
Extraction of metals from halides – Titanium, Uranium and Zirconium
Nuclear Reactor Materials.

METAL JOINING
Metal joining - welding, brazing and soldering. Different welding processes, types of tooling, equipment and applications. Gas welding, Arc welding, Submerged arc welding, TIG, MIG, Plasma arc welding, Electron Beam welding, Laser welding, Diffusion welding.
Microstructure of fusion and heat affected zone, welding stresses, pre and post weld treatments.
Weldability of structural steels, cast irons, stainless steels and other high - alloyed steels.
Weldability of Copper and its alloys, Aluminum and its alloys, Joining of dissimilar alloys.
Welding defects and remedies.

METAL CASTING
Types of foundries, Pattern materials, types and pattern allowances
Moulding materials: Properties and Selection of materials and additives used
Casting processes and equipment, Investment casting, Die casting, Centrifugal casting, Core moulds and cores.
Solidification- Crystallisation and development of cast structure, Dendritic freezing, Foundry characteristics.
Principles of Gating and Risering. Casting design considerations
General principles of melting: Cupola and its operation. Modern developments in Cupola. Melting practices of Al, Cu and Mg alloys. Defects in castings. Inspection and quality control of castings, Metallurgy of cast irons. Foundry practices of white cast iron, gray cast iron, S.G. and malleable iron. Alloy cast iron. Steel foundry practice.
Modernization and mechanization of foundries.

MECHANICAL METALLURGY
Metallurgical Fundamentals: Elasticity, yield criteria and plasticity, Defects in crystalline materials, Elements of dislocation theory - types of dislocations, dislocation Interactions and reactions, Partial dislocations, Forces on dislocations. Frank-Reed source. Slip and Twinning. Strengthening mechanisms. Recovery, recrystallisation and grain-growth.
Fundamentals of metal working. Classification of forming processes. Temperature in metal working. Strain-rate effects on Metallurgical Structure. Friction and Lubrication.
Forging - classification, equipment. Forging defects
Rolling - classification. Rolling mills. Roll pass design. Forces and geometric relationships in rolling, Rolling variables. Problems and defects in rolled products.
Extrusion -. Classification. Equipment. Extrusion variables. Lubrication and defects in extrusion. Extrusion of tubing.
Miscellaneous working operations. Drawing of rods wires and tubes. Sheet metal forming.
Powder Metallurgy. Methods of production of metal powders. Particle size analysis Characterization of metal powders. Compacting, sintering and their mechanisms. Industrial applications.

MATERIAL TESTING
Tension test – stress - strain relations, Flow curve. Instability in tension. Effect of temperature and strain rate. Yield point phenomena. Strain ageing. Compression test.
Hardness test - principle and types, Hardness at elevated temperatures.
Brittle fracture and impact testing - Notched bar impact tests. Transition temperature. Metallurgical factors affecting transition temperature. Plane strain fracture toughness (K_{IC})

Fatigue - Stress cycles, S-N diagram, Structural features, Fatigue crack propagation. Factors affecting fatigue.

Creep and stress rupture. Creep curve. Structural changes during creep. Mechanism of creep deformation. Stress rupture test, High temperature alloys.

Fracture: Types, Griffith theory of brittle fracture. Metallographic aspects of fracture. Fractography

Non-destructive testing - Principles, methods and applications of Visual, Liquid Penetrant and Dye Penetrant tests. Fluorescent test. Radiography. X-ray, Gamma ray and Neutron methods. Ultrasonic methods of inspection. Magnetic methods. Magna flux and magna glow methods. Acoustic emission methods, Eddy current tests, Pressure testing.

PAPER-II:COMPUTER SCIENCE ENGINEERING

Engineering Mathematics:

1. **Probability and Statistics**: Probability, Conditional Probability; Probability Density Function, Mean, Median, Mode and Standard Deviation; Random Variables; Distributions; uniform, normal, exponential, Poisson, Binomial.
2. **Set Theory & Algebra:** Sets; Relations; Functions; Groups; Partial Orders; Lattice; Boolean Algebra.
3. **Linear Algebra:** Algebra of matrices, determinants, systems of linear equations, Eigen values and Eigen vectors.
4. **Numerical Methods:** LU decomposition for systems of linear equations; numerical solutions of non-linear algebraic equations by Secant, Bisection and Newton-Raphson Methods; Numerical integration by trapezoidal and Simpson's rules.
5. **Calculus:** Limit, Continuity & differentiability, Mean value Theorems, Theorems of integral calculus, evaluation of definite & improper integrals, Partial derivatives, Total derivatives, maxima & minima.

Computer Science and Information Technology:

1. **Combinatorics:** Permutations; Combinations; Counting; Summation; Generating functions; Recurrence relations.
2. **Graph Theory:** Connectivity; spanning trees; Cut vertices & edges; covering; matching; independent sets; Colouring; Planarity; Isomorphism.
3. **Mathematical Logic:** Propositional Logic; First Order Logic.
4. **Digital Logic:** Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point).
5. **Computer Organization and Architecture:** Machine instructions and addressing modes, ALU, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.
6. **Programming and Data Structures:** Programming in C; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps.
7. **Algorithms:** Analysis, Asymptotic notation, space and time complexity, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and conquer; Tree and graph traversals, Connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching. Asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basic concepts of complexity classes P, NP, NP-hard, NP-complete.
8. **Theory of Computation:** Regular languages and finite automata, Context free languages and Push-down automata, Recursively enumerable sets and Turing machines, Undecidability.
9. **Compiler Design:** Lexical analysis, Parsing, Syntax directed translation, Runtime environments, Intermediate and target code generation, Basics of code optimization.
10. **Operating Systems:** Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, Memory management and virtual memory, File systems, I/O systems, Protection and security.
11. **Databases:** ER-model, Relational model (relational algebra, tuple relational calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.
12. **Information Systems and Software Engineering:** Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance.
13. **Computer Networks:** ISO/OSI reference model, LAN technologies (Ethernet, Token ring), Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP and sockets, IPv4, Application layer protocols (ICMP, DNS, SMTP, POP, FTP, HTTP); Basic concepts of hubs, switches, gateways, and routers. Network security: basic concepts of public key and private key cryptography, digital signature, firewalls.
14. **Web technologies:** HTML, XML, basic concepts of Client-Server computing.

PAPER-II:ELECTRICAL AND ELECTRONICS ENGINEERING

1.Electric Circuits and Fields: Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin's, Norton's, Superposition, Maximum Power Transfer and Reciprocity theorems; two-port networks, three phase circuits; Star, Delta connections, Measurement of power by two-wattmeter method; Fourier, Laplace and Z transforms; Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions; Ampere's and Biot-Savart's laws; inductance; dielectrics; capacitance.

2.Electrical Machines: Single phase transformer - equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers - connections, parallel operation; auto-transformer; energy conversion principles; DC machines - types, windings, generator and motor characteristics, losses and efficiency, armature reaction and commutation, starting and speed control of motors, tests; three phase induction motors - principles, types, performance characteristics, starting and speed control; single phase induction motors; synchronous machines - performance, regulation and parallel operation of alternators, motor starting, characteristics and applications; servo motors.

3.Power Systems: Basic power generation concepts, Economic aspects, Types of Tariffs; transmission line models and performance; cable performance, insulators, Sag and Tension; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow study; voltage control; power factor correction; economic operation; Load Frequency Control; symmetrical components; symmetrical & unsymmetrical fault analysis; principles of over-current, differential and distance protection; Generator protection, Transformer protection, Feeder protection, static relays; circuit breakers; Power system stability concepts, swing equation, power angle curve, solution of swing equation, equal area criterion.

4.Control Systems: Principles of feedback; transfer function; block diagrams; steady-state errors; Routh and Nyquist techniques; Bode plots; root loci; lag, lead and lead-lag compensation; state space model; state transition matrix, controllability and observability.

5.Electrical and Electronic Measurements: DC, AC Bridges, potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; shunts, multipliers; instrument transformers; digital voltmeters, CRO; phase, time and frequency measurements using lissajous patterns; error analysis.

6.Analog and Digital Electronics: Characteristics of p-n junction diode, Zener diode, BJT, FET; amplifiers - biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers - characteristics and applications; simple active filters; VCOs and timers; Boolean Algebra, mizimizition of switching functions combinational and sequential logic circuits; schimitt trigger, multi vibrators Flip flops, counters and registers, sample and hold circuits; A/D and D/A converters; microprocessor basics.(8085 & 8086), architecture, programming and interfacing.

7.Power Electronics : Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs - static characteristics and principles of operation; triggering circuits commutation circuits; phase control rectifiers; bridge converters - fully controlled and half controlled; dual converters, principles of choppers, inverters, cyclo-converters and ac voltage controllers.

8.Electric Drives: Four quadrant operation, Types of loads, Energy loss during starting and braking of dc and ac motors, Types of braking in dc & ac motors, Basis concepts of converter and chopper fed dc drives; V/f control, static rotor resistance control and slip power recovery scheme of 3-phase induction motor drives.

9.Utilization: High frequency eddy current heating, dielectric heating, Arc furnace, electric arc welding & electric resistance welding, Illumination: Laws of illumination, MSCP, SV & MV lamps, Factory, street & flood lighting, Electric traction and track electrification, Speed-time curves, Tractive effort, Specific energy consumption, Mechanism of train movement, adhesive weight and coefficient of adhesion. DC motor series parallel control, energy saving.