

**TELANGANA STATE PUBLIC SERVICE COMMISSION: HYDERABAD**

**NOTIFICATION NO. 20/2022, DATED: 07/12/2022**

**LECTURERS IN GOVERNMENT POLYTECHNICS IN TECHNICAL EDUCATION SERVICE  
(GENERAL RECRUITMENT)**

**PARA – I:**

1) Applications are invited Online from qualified applicants through the proforma Application to be made available on Commission's website (<https://www.tspsc.gov.in>) to the posts of **Lecturers in Government Polytechnics in Technical education service in the State of Telangana.**

i) Submission of ONLINE applications starts from **Dt. 14/12/2022.**

ii) Last date and time for submission of ONLINE applications is upto 5.00 PM on **04/01/2023.**  
**The payment of Fee will be accepted upto 5:00 P.M of last date for submission.**

2) The details of **Lecturer** vacancies subject wise are given below: -

Pc. No.	NAME OF THE SUBJECT	MULTI ZONE		Total Vacancies	Age as on 01/07/2022 Min. Max.	Scale of Pay Rs.
		MZ-I	MZ-II			
01	Auto Mobile Engineering	–	15	15	18-44	<b>Level-9A</b> 56,100- 1,77,500/-  <b>Level-10</b> 57,700- 1,82,400/-
02	Bio-Medical Engineering	–	03	03		
03	Chemical Engineering	–	01	01		
04	Civil Engineering	33	49	82		
05	Electrical and Electronics Engineering	05	19	24		
06	Electronics and Communication Engineering	19	22	41		
07	Electronics and Instrumentation Engineering	–	01	01		
08	Foot Wear Technology	–	05	05		
09	Letter Press (Printing Technology)	–	05	05		
10	Mechanical Engineering	26	10	36		
11	Metallurgy	04	01	05		
12	Packaging Technology	–	03	03		
13	Tannery	–	03	03		
14	Textile Technology	01	–	01		
15	Architecture Engineering	–	04	04		
16	Pharmacy	02	02	04		
17	Geology	01	–	01		
18	Chemistry	02	06	08		
19	Physics	–	05	05		
<b>Total</b>		<b>93</b>	<b>154</b>	<b>247</b>		

**(The Details of Vacancies i.e., Community-wise, PH-wise, EWS, Sports Category, Multi Zone and Gender-wise (General/Women) may be seen at Annexure-I.)**

**IMPORTANT NOTE:-** The number of vacancies are subject to variation on intimation being received from the Department concerned. Addition of vacancies if any, will be accepted only before the date of examination and an addendum to that effect will be issued. Deletion of vacancies if any, can be effected upto the declaration of result.

3) **(i) The Examination (Objective Type) is likely to be held in the Month of May/June-2023 and the Commission reserves the right to conduct the Examination either through COMPUTER BASED RECRUITMENT TEST (CBRT) OR OFFLINE OMR BASED EXAMINATION OF OBJECTIVE TYPE.**

**(ii) Exact date for the above examination will be announced later.**

**(iii) Hall Tickets can be downloaded from 7 days prior to the examination.**

**(iv) Candidates are instructed to read the instructions at Annexure-IV of this Notification and Instructions printed on the Hall Ticket carefully.**

4) Before applying for the posts, candidates shall register themselves on the One Time Registration (OTR) through the Official Website of TSPSC (<https://www.tspsc.gov.in>). Those who have registered in OTR already shall apply by login to their profile using their TSPSC ID and Date of Birth as provided in OTR. (In case if the candidate has forgotten the TSPSC ID, the candidate has to visit the TSPSC website and click on the link "Know Your TSPSC\_ID" and enter the Aadhar Number and Date of Birth and get the TSPSC-ID). If the candidate did not register Aadhar Number in OTR, candidate has to enter either his/her registered mobile number or Name and Date of Birth to get the TSPSC ID).

**Note:-** i) One Time Registration is not considered as an application for any post under any circumstances.

ii) The applicants are advised to retain their Mobile Number and email ID registered in OTR for receiving OTP/SMS for further communication.

**IMPORTANT NOTE:** Applicants are requested to keep the soft copy of the following documents ready while uploading their Applications and updating the OTRs.

- i. Aadhar Card /Voter ID / Pass Port / Driving License / Service ID Cards with (Photograph issued by Central/State/PSU/Public Limited Companies) / Passbook with (photograph by Bank / Post Office) / PAN Card.
- ii. Educational Qualifications i.e., SSC, Intermediate, Degree, Post Graduation etc.,
- iii. Study (Bonafide) / Residence Certificate (1<sup>st</sup> to 7<sup>th</sup> Class period).
- iv. Community Certificate (SC/ST/BC), Non-Creamy Layer Certificate in case of BCs issued by the competent authority of Telangana Government.
- v. Income certificate for the Financial Year prior to the year of application issued by the competent authority of Telangana Government for claiming EWS reservation.
- vi. Certificates claiming Sports & PH reservation, and age relaxation for Ex-Servicemen.

5) The applicants who possess requisite qualification may apply online by satisfying themselves about the terms and conditions of this recruitment.

**6) EDUCATIONAL QUALIFICATIONS:** Applicants must possess the requisite qualifications as detailed below, specified in the relevant Service Rules, indented by the Department, **as on the Date of Notification.**

Pc. No.	Name of the Subject	Educational Qualifications as specified in the Service Rules of the Department vide G.O.Ms.No.26 Higher Education (TE) Dept., Dt. 30.07.2021
01	Automobile Engineering	<b>1. Level-9A</b> Those possessing a minimum of 4 years Bachelor's Degree in BE/B.Tech/B.S in relevant disciplines with First Class or Equivalent shall be placed in Level-9A at entry pay of Rs.56,100/-.  <b>2. Level-10</b> Bachelor's and Master's Degree in relevant disciplines with First Class in either of the two at the time of Selection shall be placed in Level-10 at entry pay of Rs.57,700/-.
02	Bio-Medical Engineering	
03	Chemical Engineering	
04	Civil Engineering	
05	Electrical and Electronics Engineering	

06	Electronics and Communication Engineering	<p><b>1. Level-9A</b> Those possessing a minimum of 4 years Bachelor's Degree in BE/B.Tech/B.S in relevant disciplines with First Class or Equivalent shall be placed in Level-9A at entry pay of Rs.56,100/-</p> <p><b>2. Level-10</b> Bachelor's and Master's Degree in relevant disciplines with First Class in either of the two at the time of Selection shall be placed in Level-10 at entry pay of Rs.57,700/-</p>
07	Electronics and Instrumentation Engineering	
08	Foot Wear Technology	
09	Letter Press (Printing Technology)	
10	Mechanical Engineering	
11	Metallurgy	
12	Packaging Technology	
13	Tannery	
14	Textile Technology	
15	Architecture Engineering	<p><b>1. Level-9A</b> Those possessing a minimum of 4 years Bachelor's Degree in B.Arch or 4 years Degree in allied field with First Class or Equivalent shall be placed in Level-9A at entry pay of Rs.56,100/-</p> <p><b>2. Level-10</b> Bachelor's and Master's Degree in relevant disciplines with First Class in either of the two at the time of Selection shall be placed in Level-10 at entry pay of Rs.57,700/-.</p>
16	Pharmacy	<p><b>1. Level-9A</b> Those possessing a minimum of 4 years Bachelor's Degree in B.Pharmacy with First Class or Equivalent shall be placed in Level-9A at entry pay of Rs.56,100/-.</p> <p><b>2. Level-10</b> Bachelor's and Master's Degree in relevant disciplines with First Class in either of the two at the time of Selection shall be placed in Level-10 at entry pay of Rs.57,700/-.</p>
17	Geology	<p><b>1. Level-9A</b> Those possessing Master's Degree in Appropriate subject with First Class or Equivalent at Bachelor's or Master's Level shall be placed in Level-9A at entry pay of Rs.56,100/-.</p> <p><b>2. Level-10</b> A Master's Degree with First Class or Equivalent in relevant subject and must have cleared the National Eligibility Test (NET) conducted by UGC or CSIR, or a similar test accredited by the UGC like SLET/SET or possessing Ph.D. shall be placed in Level-10 at entry pay of Rs.57,700/-.</p>
18	Chemistry	
19	Physics	
<p><b>NOTE:</b> 1) First Class or Equivalent as specified for Level – 9A &amp; First Class either two (i.e., Bachelor's or Master's) at Level -10 of Para 4.1(a) &amp; 4.2(a) of Appendix-B for all Categories except SC/ST. 2) Relaxation of 5% of Marks for SC/ST (i.e., 55% or 6.25 Grade point is enough for SC/ST Candidates) as mentioned in Para 6.3 read with 2.20 of Appendix-B.</p>		

If a class / division is not awarded, minimum of 60% marks in aggregate shall be considered equivalent to first class / division. If a Grade Point System is adopted the CGPA will be converted into equivalent marks as below:

Grade Point	Equivalent Percentage
6.25	55%
6.75	60%
7.25	65%
7.75	70%
8.25	75%

**IMPORTANT NOTE:-** 1) **For Pc. No. 17, 18 &19:-** Master's Degree in appropriate subject with First Class or equivalent at Bachelor's or Master's Level.  
2) The First Class shall be either at Bachelor's or Master's Level.

**N.B:- i) Distance Education:-** The Applicants who have obtained requisite Degrees through Open Universities / Distance Education mode are required to have recognition by the University Grants Commission / AICTE / Distance Education Bureau as the case may be. Unless such Degrees have been recognised by the relevant Statutory Authority, they will not be accepted for purpose of Educational Qualification vide its Public Notice No. F.27-1/2012 (CPP-II), Dt. 27/06/2013. (A university established or incorporated by or under a State act shall operate only within the territorial jurisdiction allotted to it under its Act and in no case beyond the territory of the State of its location). The onus of proof of recognition by the relevant Statutory Authority that their Degrees / Universities have been recognised rests with the candidate.

ii) **Equivalent Qualification:** At the time of verification of certificates, if it is noticed that any applicant possessing other than prescribed qualification and claims it as equivalent to the prescribed qualifications, then an Expert Committee will be constituted including the Unit Officer by the Commission and the Commission will take a decision based on the report of the Expert Committee.

**7) AGE:** The candidates should possess Minimum 18 years & Maximum 44 years. The age is reckoned as on 01/07/2022 (Rule-12(1)(a)(v) of State and Subordinate Service Rules).

**(As per G.O.Ms.No.42, G.A.(Ser.A) Department, Dt. 19/03/2022 the upper age limit is raised up to 10 years i.e., from 34 years to 44 years)**

**Minimum Age (18 years):** An Applicant should not be born after **01/07/2004**

**Maximum Age (44 years):** An applicant should not be born before **02/07/1978**

The Upper Age limit will be relaxed as per Rules and will be calculated on the above lines.

**Age Relaxations:** The upper age limit prescribed above is however relaxable in the following cases:

Sl. No.	Category of candidates	Relaxation of age permissible
1.	Telangana State Government Employees (Employees of TSRTC, Corporations, Municipalities etc. are not eligible).	Upto 5 Years based on the length of regular service.
2.	Ex-Service men	3 years & length of service rendered in the armed forces.
3.	N.C.C. (who have worked as Instructor in N.C.C.)	3 Years & length of service rendered in the N.C.C.
4.	SC/ST/BCs & EWS	5 Years
5.	Physically Handicapped persons	10 Years

**Note:** Provided that the persons referred at Sl.No. 2&3 above shall, after making deductions referred to in Sub Rule-12(c)(i)&(ii) of Telangana State and Subordinate Service Rules not exceed the maximum age limit prescribed for the post.

- The age relaxation for Ex-servicemen is applicable for those who have been released from Armed forces other than by way of Dismissal or Discharge on account of misconduct or Inefficiency.
- The age relaxation for NCC, a Person who was recruited as a whole-time Cadet Corpse Instructor on or after the 1st January, 1963 on his discharge from the NCC either before or after the expiry of the initial or extended tenure of his office in NCC having served for a period of not less than six months prior to his release from the NCC.

**N.B.** However, no person shall be eligible if he/she crossed 61 years of age (Superannuation age) after availing the eligible age relaxations as on 01/07/2022.

**8) (A) FEE:**

- i) **Application Processing Fee:-** Each applicant must pay Rs. 200/- (Rupees Two Hundred Only) towards Online Application Processing Fee.
- ii) **Examination Fee:-** The applicants have to pay RS. 120/- (Rupees One Hundred and Twenty Only) towards Examination Fee. However,
  - a) All unemployees are exempted from payment of examination fee, and
  - b) All Employees of any Government (Central / State / PSUs / Corporations / Other Government Sector) have to pay the prescribed examination fee.

**B) Mode of Payment of Fee:**

The Fee mentioned at Para-I(8)(A) is to be paid online through payment gateway duly following online instructions once the application form details are submitted.

The fee once remitted, shall not be refunded or adjusted under any circumstances. Failure to pay the Application Processing fee and Examination fee, wherever applicable, will entail total rejection of application. Unless full payment of both Examination fee (**unless exempted**) and Application fee is made, the candidature of the applicant will be rejected and no correspondence or concession in this regard will be entertained. The list of Banks providing service for the purpose of online remittance of fee is given in **ANNEXURE – II.**

**PARA-II: CENTRES FOR THE WRITTEN EXAMINATION:**

- 1) The Written Examination (Objective Type) will be held at the following centres or as may be decided by the Commission.
  - i) HYDERABAD (including HMDA Jurisdiction)
  - ii) KARIMNAGAR
  - iii) KHAMMAM
  - iv) HANUMAKONDA
  - v) NIZAMABAD
- 2) However, the Commission reserves the right to allot candidates to any centre other than the centre chosen by the applicant or to remove / create a new centre for administrative reasons. Request for change of the centre will not be entertained.

**PARA-III: HOW TO APPLY:**

**HOW TO SUBMIT THE ONLINE APPLICATION FORM:**

- (i) The Applicant has to read the **User Guide** (<https://www.tspsc.gov.in>) for Online Submission of Applications and then proceed further.
- Step I:** Before applying, the Applicant has to visit the website (<https://www.tspsc.gov.in>) and fill the OTR application if not registered earlier to obtain TSPSC ID. The candidates are advised to upload all the required certificates (However, original certificates have to be produced for verification at the time of scrutiny before finalizing the selection list). While filling the OTR, the applicant has to ensure that there are no mistakes in it. The Commission will not be held responsible for the mistakes, if any, made by the applicants. If already registered in the OTR the applicant can directly access the application form. The applicant is instructed to fill his/her application form himself/herself with utmost care instead of delegating to others.
- Step II:-**
- a) In order to fill the application form, the Applicant has to visit the website (<https://www.tspsc.gov.in>) and Click on the online Application Link provided on the Website, then enter TSPSC ID and Date of Birth and login with OTP received to proceed further.
  - b) Applicant has to verify the details fetched from OTR database pertaining to Name, Date of Birth, requisite Educational Qualifications, Community, Gender, Ex-Servicemen & Sports etc., displayed on the screen.
  - c) In addition to the details obtained from OTR database, specific details of Notification such as Examination Centre opted, required qualification and declarations etc., should be filled by the applicant.
  - d) Preview and Edit facility is available to make changes and then click on SAVE & PAY button for proceeding to next step of making online payment of fee through payment gateway.

**Step III:-** The applicant should pay the prescribed fee as specified through any of the three modes of payment online i.e., Net Banking, Debit Card and Credit Card duly following the instructions appearing on the screen.

**Step IV:-** After payment of fee, the PDF application will be generated which contains the particulars furnished by the applicant. The applicant must download a copy of his/her submitted form (PDF). The Reference ID Number in the PDF application form has to be quoted for future reference/correspondence.

- 1) Applicant shall note that, the details available in OTR database at the time of submitting the application will only be considered for the purpose of this notification. Hence, the candidate is advised to update / edit the details in OTR form before submitting online application form. The Time and Date of submission of the application will be printed on the application PDF form. Changes made by the applicant in OTR details after submission of application form will not be considered for the purpose of this Notification.
- 2) The Commission is not responsible for any discrepancy in Bio-data particulars submitted in the application form. The applicant is therefore advised to strictly follow the instructions and User guide in his/her own interest before submitting the application.
- 3) Applicant must compulsorily fill-up all relevant columns of the application form. The eligibility of the applicant will be decided based on the particulars given in the online application form in terms of notification and it is validated by the software and it will be taken as final. For eg: If an applicant fails to update the OTR regarding his/her Sports status before applying, the applicant will not be considered for Sports vacancies. Applicant should therefore be very careful, while entering the data and uploading / submitting the application form online.
- 4) Incomplete / incorrect application form will be rejected. The information if any furnished by the applicant subsequently in any form will not be entertained by the Commission under any circumstances unless specifically called for. Applicant should be careful in filling-up the application form and submission. If any lapse is detected during the scrutiny/verification of certificates, the candidature will be rejected even though he/she comes through the final stage of recruitment process or even at a later stage.
- 5) Before uploading/submission of application form, the applicant should carefully ensure his/her eligibility for this examination. No relevant column of the application form should be left blank, otherwise application form will not be accepted.
- 6) The Commission will not make any corrections in the application form submitted by the applicant.
- 7) Applicant must click on Save & Pay Button after filling and preview of the application. Otherwise the application particulars will not be saved in the database.
- 8) Hand written/ Typed/ Photostat copies/ outside printed Application Form will not be entertained. The Commission will not be held responsible for the applications submitted in any other mode.
- 9) For any Technical problems related to Online submission and downloading of Hall-Tickets please contact 040-23542185 or 040-23542187 (Call Time: 10.30 A.M to 1.00 P.M & 1.30 P.M to 5.00 P.M on working days) or mail to [helpdesk@tspsc.gov.in](mailto:helpdesk@tspsc.gov.in).

#### **PARA- IV GENERAL PROVISIONS**

- 1) The applications received online in the prescribed proforma within the time shall only be considered.
- 2) Applicant must upload his/her scanned recent pass port size photo and signature in .jpeg format.
- 3) The applicant should not furnish any particulars that are false, tampered, fabricated or suppress any material information while submitting online application.
- 4) All the essential certificates issued by the competent authority of Telangana State shall be kept with the applicants at the time of submitting the application.
- 5) The required original certificates should be submitted at the time of verification of certificates or whenever called for. Failure to produce the required certificates will lead to disqualification.
- 6) **Important:** –The claim of the applicants with regard to the date of birth, educational qualifications and community etc., are accepted provisionally on the information furnished by them in their application form and is subject to verification and satisfaction of the

Commission. Mere admission to any test or inclusion of the name of an applicant in a Merit List will not confer on the applicant any right for appointment. The candidature is therefore, provisional at all stages and the Commission reserves the right to reject candidature at any stage of the selection even after declaration of results, if any mistake/wrong information is noticed at a later date.

7) The applicants should be willing to serve anywhere in Telangana State.

8) **NOTE ON UTILISING EDIT OPTION BY CANDIDATES:**

The applicant should follow the TSPSC website regularly to utilize the edit option if given by the Commission at any point of time. No separate advertisement / notification will be issued in any news paper. No separate individual intimation shall be given.

9) **Invalidation of OMR Answer Sheet: -**

- a) If any applicant fails to bubble or wrongly bubble the Question Booklet Number, Hall Ticket Number in the OMR Answer Sheet, such Answer Sheets are invariably invalidated as they are valued by Optical Mark Reader. This stipulation is to avoid any sort of human interface in evaluation of the Scripts.
- b) Tampering of OMR answer sheet by using whitener, eraser, blade and chalk powder etc., and also tampering of barcode by any means leads to invalidation.
- c) No request for reconsideration of such rejected/invalidated cases will be entertained.

10) **A) The following certificates / documents must be submitted by the candidates at the time of verification of certificates.**

- i) PDF Application form
- ii) Hall Ticket.
- iii) Aadhar Card /Voter ID / Pass Port / Driving License / Service ID Cards with (Photograph issued by Central/State/PSU/Public Limited Companies) / Passbook with (photograph by Bank / Post Office) / PAN Card.
- iv) Proof of Educational Qualifications.
- v) S.S.C / CBSE / ICSE (For Date of Birth)
- vi) School Study Certificate (1<sup>st</sup> to 7<sup>th</sup> Class)
- vii) Certificate of Residence (where the Candidate has not studied in Educational Institution) (1<sup>st</sup> to 7<sup>th</sup> Class period) obtained from competent authority of Telangana Government.
- viii) Declaration by the Unemployed (For claiming exemption from payment of exam fee).
- ix) No Objection Certificate from Employer (even if employed at any later stage of recruitment).
- x) Service Certificate (If any employee claimed Age relaxation).
- xi) Certificate claiming sports reservation.
- xii) Certificate claiming Ex-servicemen for age relaxation.
- xiii) Community Certificate for BCs, SCs & STs (Issued in the name of candidate with Father Name is only acceptable.) obtained from competent authority of Telangana Government.
- xiv) Non-Creamy Layer Certificate for BCs as per Form- VII B vide G.O. Ms. No. 34 BC Welfare (OP) Department Dt.08/10/2015 and G.O. Ms. No. 20 BC Welfare (OP) Department Dt.31/10/2017 (Certificate issued in the name of candidate as S/o OR D/o is only acceptable.) obtained from competent authority of Telangana Government.
- xv) Income certificate for the Financial Year prior to the year of application issued by the competent authority of Telangana government for claiming EWS reservation.
- xvi) In case of PH Candidates, Visually Handicapped / Hearing Disability & Hearing Impairment / Orthopedically Handicapped / Multiple disabilities, certificates should be obtained from Competent Medical Authority in SADAREM format relevant to them.
- xvii) Any other certificate required.

**B) Guidelines for evaluation of various disabilities and procedure for certification** are mentioned in G.O.Ms.No.31, WD, CW & (DW) Dept, Dt:01-12-2009.

1. Physically Challenged candidates who are claiming reservations under Disability quota must note that they will be referred to State Medical Board (Appellate Medical Authority) after completion of certificate verification. The report of Medical Board is final.
2. Request for re-medical-examination by the State Medical Board (Appellate Medical Authority) for assessment of disability will not be entertained.

**Note:-**The Certificate formats are available on Commission's website <https://www.tspsc.gov.in/certificateformats.jsp>.

**PARA-V :- IMPORTANT LEGAL PROVISIONS GOVERNING THE RECRUITMENT PROCESS:**

1. **Vacancies:** The recruitment will be made to the vacancies notified before the examination only. There shall be no waiting list as per G.O. Ms. No. 81 General Administration (Ser.A) Department, Dated 22/02/1997 and as per Rule 6 of TSPSC Rules of Procedure.
2. Unfilled and Non-Joining vacancies will be Carried Forward to next recruitment.
3. This Recruitment is entrusted to TSPSC along with Finance Clearance vide G.O.Ms.No.116 Finance (HRM.VII) Department, Dt. 22/07/2022.
4. **Recruitment:-** The Recruitment will be processed as per this Notification and also as per the Rules and Instructions issued by the Government and also as decided by the Commission from time to time in terms of respective Special Rules/Adhoc Rules governing the Recruitment vide G.O. Ms. No. 178 Higher Education (TE.I-2) Dept., Dt. 09/12/2005 read with G.O. Ms. No. 26, Higher Education (TE) Dept., Dt. 30/07/2021 and as per Government Orders issued from time to time, and other related G.Os, Rules etc., applicable in this regard.
5. **Rules:** All are informed that the various conditions and criterion prescribed herein are governed by the General Rules of existing State and Subordinate Service Rules, read with the relevant Special Rules applicable to any particular service in the departments. Any guidelines or clarification is based on the said Rules, and, in case of any necessity, any matter will be processed as per the relevant General and Special Rules in force.
6. **Constitutional Provisions:-** The Commission is empowered under the provisions of Article 315 and 320 of the Constitution of India read with relevant laws, rules, regulations and executive instructions and all other enabling legal provisions in this regard to conduct examination for appointment to the posts notified herein, duly following the principle of order of merit as per **Rule 3** of the TSPSC Rules of Procedure read with reference to relevant statutory provisions and ensuring that the whole recruitment and selection process is carried out with utmost regard to maintain secrecy and confidentiality so as to ensure that the principle of merit is followed.
7. **Multi Zonal Post:-** The posts are classified into Multi Zonal posts and the local reservation is applicable as per G.O.Ms.No.124, General Administration (SPF-MC), Department, Dated 30-08-2018.
8. **Local:-**The Local Reservations shall be followed as per the Telangana Public Employment (Organization of Local Cadres and Regulation of Direct Recruitment) Order, 2018, G.O.Ms.No.124, General Administration (SPF-MC), Department, Dated 30-08-2018 as amended vide G.O.Ms. No. 128, G.A. (SPF-I) Dept., Dated: 30/06/2021 and other orders issued by the Government of Telangana from time to time and other related G.Os, Rules etc., applicable.
9. **Employee Details:-** The persons already in Government Service/ Autonomous bodies/ Government aided institutions etc., whether in permanent or temporary capacity or as work charged employees are required to inform in writing to the Head of Office / Department, that they have applied for this recruitment, as the case may be and required to submit the "No Objection Certificate" from the Head of Office / Department concerned to the Commission as and when required to do so.  
  
The persons who are employed after submission of application or at any later stage for this recruitment should also submit "No Objection Certificate" from the Head of Office / Department concerned to the Commission as and when required to do so.
10. **A) Penal Action:-** The Commission is also empowered to invoke the penal provisions of the T.S. Public Examinations (Prevention of Malpractices and Unfair means) Act, 1997 (Act No.25/1997) for matters connected therewith or incidental thereto and as per the Rules of Procedure of TSPSC published in Telangana Gazette No: 60 dated 28/12/2015 in respect of this Notification.  
  
**B) Disqualification for appointment:** A candidate shall be disqualified at any stage as per Rule-12(4) of Telangana State and Subordinate Service Rules.
- 11) **Community:** (a) The candidates belonging to SC & ST are required to produce Community Certificate issued by the competent authority (obtained from Government of Telangana State) in terms of G.O.Ms No. 58, SW (J) Dept., dt: 12/5/97 read with G.O. Ms. No. 5 Scheduled Castes Development (POA.A2) Dept., dt. 08/08/2014, G.O. Ms. No. 11 Scheduled Castes Development (POA.A2) Dept., dt. 17/09/2014 and G.O. Ms. No. 2 Scheduled Castes Development (POA.A2) Dept., dt. 22/01/2015. As per Rule-2(29) of T.S. State and Subordinate Service Rules. Explanation: No person who professes a religion different from Hinduism, the Sikh or Buddhism shall be deemed to be as member of a Scheduled Caste. (b)The candidates belonging to Backward Classes are required to produce Community Certificate (BC-A, BC-B, BC-C, BC-D & BC-E) issued by the

Competent Authority in the State of Telangana obtained through Mee-Seva vide G.O. Ms. No. 16 BCW (OP) Dept., Dt. 11/03/2015. (c) Income Certificate for claiming EWS Reservation issued by the Tahsildar (Government of Telangana) vide G.O. Ms. No. 244 General Administration (Ser.D) Department, Dt. 24/08/2021 and orders and instructions issued by the Government from time to time.

12) **Reservation:** -

- (i) The rule of reservation is applicable in terms of General Rule 22 & 22 (A) of Telangana State and Subordinate Service Rules.
- (ii) Reservation to Disabled persons is subject to the Special Rules/Adhoc Rules governing the posts. The extent of Disability will be decided by the State Appellate Medical Authorities.
- (iii) If eligible disabled women candidates of VH(W) / HH(W) / OH(W) / MH(W) category are not available in the initial recruitment, the same shall be filled up by the eligible Male candidates with same category of disability respectively as per G.O.MS. No. 96 General Administration (Ser.D) Department, Dt. 22/07/2019. Hence, eligible male candidates of VH/ HH/ OH/ MH disabled category can also apply for the posts meant for Women categories.
- (iv) For Carry Forward PH vacancies, if eligible disabled candidates of that particular category are not available, the same shall be filled up by the method of interchanging as per G.O.MS. No. 96 General Administration (Ser.D) Department, Dt. 22/07/2019. Hence, candidates of all the disabled categories can apply.
- (v) Reservation to BC-E group as per G.O. Ms. No. 23 Backward Classes Welfare (C.2) Department, Dt. 07/07/2007, will be subject to the adjudication of the litigation before the Honorable Courts including final orders in Civil Appeal No: (a) 2628-2637 of 2010 in SLP. No. 7388-97 of 2010, dated. 25/03/2010 and orders from the Government.
- (vi) The reservation to Meritorious Sports Person is applicable as per the amendments made to State and Subordinate Service Rules as per G.O.Ms.No.107, General Administration (Ser.D) Dept., Dt. 27-07-2018 that is in Rule-2, for sub-Rule (20) and in Rule-22 (i) in sub-Rule (2), for Class-D. In implementing the reservation to Meritorious Sports Person as per G.O. Ms. No.05 YAT&C(Sports) Department, Dt. 14/05/2018, or as may be revised by the Government from time to time shall be followed.
- (vii) **Economically Weaker Sections:-** The EWS reservation is applicable as per G.O. Ms. No. 243 & 244 GA (SER.D) Dept., Dt. 24/08/2021.
- (viii) As per G.O.Ms.No.130, General Administration (Ser.D) Department, Dt.09.11.2022, enhancing the reservations for Scheduled Tribes from 6% to 10% read with G.O.Ms.No.135, General Administration (Ser.D) Department, Dt.23.11.2022.

**Note:-Candidates producing Certificates issued by the Competent Authorities in Telangana State alone are eligible to claim various reservations like SC/ST/BC/ EWS/PH etc.**

**PARA-VI:**

(1) Local Reservation (95%) is applicable as per Para-8 of G.O.Ms.No.124 General Administration (SPF-MC) Department, dated :30.08.2018).

**(2) Local Candidate as per Para-7 of G.O.Ms.No.124 General Administration (SPF-MC) Department, Dated :30.08.2018:-**

“(1) A candidate for direct recruitment to any post shall be regarded as a local candidate in relation to a local area,-

(a) in cases where a minimum educational qualification has been prescribed for recruitment to the posts,-

(i) if he has studied in an educational institution or educational institutions in such local area for a period of not less than four consecutive academic years ending with the academic year in which he appeared or, as the case may be, first appeared for the relevant qualifying examination; or

(ii) where during the whole or any part of the four consecutive academic years ending with the academic year in which he appeared or as the case may be first appeared for the relevant qualifying examination he has not studied in any educational institution, if he has resided in that local area for a period of not less than four years immediately preceding the date of commencement of the qualifying examination in which he appeared, or as the case may be, first appeared.

(b) In cases where no minimum educational qualifications has been prescribed for recruitment to the post, if he has resided in that local area for a period of not less than four

years immediately preceding the date on which the post is notified for recruitment.  
 Explanations:- For the purpose of this paragraph,-

(i) 'educational institution' means a University or any educational institution recognized by the State Government, a University or other competent authority;

(ii) relevant qualifying examination in relation to a post means,-

(a) the examination, a pass in which is the minimum educational qualification prescribed for the post;

(b) the Seventh Class examination or an examination declared by the State Government to be equivalent to the Seventh Class examination; whichever is lower;

(iii) in reckoning the consecutive academic years during which a candidate has studied, any period of interruption of his study by reason of his failure to pass any examination shall be disregarded;

(iv) the question, whether any candidate for direct recruitment to any post has resided in any local area shall be determined with reference to the places where the candidate actually resided and not with reference to the residence of his parents or other guardian.

(2) A candidate for direct recruitment to any post who is not regarded as a local candidate under sub-paragraph (1) in relation to any local area shall,-

(a) in cases where a minimum educational qualification has been prescribed for recruitment to the post,-

(i) If he has studied in educational institutions in the State for a period of not less than seven consecutive academic years ending with the academic year in which he appeared or as the case may be, first appeared for the relevant qualifying examination be regarded as a local candidate in relation to,-

(A) Such local area where he has studied for the maximum period out of the said period of seven years; or

(B) Where the periods of his study in two or more local areas are equal, such local areas where he has studied last in such equal periods;

(ii) If during the whole or any part of the seven consecutive academic years ending with the academic year in which he appeared or as the case may be first appeared for the relevant qualifying examination, he has not studied in the educational institutions in any local area, but has resided in the State during the whole of the said period of seven years, be regarded as a local candidate in relation to,-

A) Such local area where he has resided for the maximum period out of the said period of seven years; or

(B) Where the periods of his residence in two or more local areas are equal, such local area where he has resided last in such equal periods;

(b) In cases where no minimum educational qualification has been prescribed for recruitment to the post, if he has resided in the State for a period of not less than seven years immediately preceding the date on which the post is notified for recruitment, be regarded as a local candidate in relation to,-

(i) such local area where he has resided for the maximum period out of the said period of seven years; or

(ii) where the periods of his residence in two or more local areas are equal such local area where he has resided last in such equal periods.

(c) In cases where Visually Handicapped and Hearing Handicapped persons studied in the special schools meant for them, the native place of the parents of such Visually Handicapped and Hearing Handicapped persons."

**3) The following are the Present Multi-Zones in the Telangana State vide G.O.Ms. No. 124, G.A. (SPF-MC) Dept., Dated: 30/08/2018 and amended vide G.O.Ms. No. 128, G.A. (SPF-I) Dept., Dated: 30/06/2021 read with G.O.Rt.No.74, Revenue (DA-CMRF) Dept., dt:12/08/2021:**

<b>Multi Zone- I</b>	Asifabad-Kumrambheem, Mancherial, Peddapalli, Jayashankar-Bhupalapalli, Mulugu Districts
	Adilabad, Nirmal, Nizamabad, Jagityal Districts
	Karimnagar, Sircilla-Rajanna, Siddipet, Medak, Kamareddy Districts
	Kothagudem- Bhadradi, Khammam, Mahabubabad, Hanumakonda (Warangal Urban), Warangal (Warangal Rural) Districts
<b>Multi Zone- II</b>	Suryapet, Nalgonda, Yadadri- Bhongir, Jangaon Districts
	Medchal-Malkajgiri, Hyderabad, Ranga Reddy, Sanga Reddy, Vikarabad Districts
	Mahaboobnagar, Narayanpet, Jogulamba-Gadwal, Wanaparthy, Nagarkurnool Districts

**PARA-VII: SCHEME OF EXAMINATION:-** The Scheme & Syllabus for the examination has been shown in ANNEXURE-III.

**PARA-VIII: RESOLVING OBJECTIONS RELATED TO QUESTIONS, KEY AND OTHER MATTERS OF OBJECTIVE TEST:**

- i) The Commission publishes the **key** on its website after conduct of the objective test. Any objections with regard to the questions / Key shall be filed within the stipulated period through the link provided in the TSPSC website, after publication of the key. The objections received physically in the form of representations or through emails are not entertained in any circumstances. Any objection(s) received after the last date for receipt of objections on key would not be entertained.
- ii) However, for each objection raised by the candidate he/she required to pay Rs.500/- (Rupees Five Hundred only) online through payment gateway duly following online instructions. The list of Banks providing service for the purpose of online remittance of payment is given in Annexure–II.
- iii) The objections received in the prescribed proforma within due date will be referred to Expert Committee for opinion to take appropriate decision thereon by the Commission. Final key will be hosted as per decision of the Commission.
- iv) Objections on final key shall not be entertained.
- v) The marks for the deleted questions, if any, will be awarded to each candidate proportionately based on his performance on the remaining questions and the marks would be considered upto 3<sup>rd</sup> decimal figure, to determine the merit of the candidates.
- vi) After completion of Examination, the Images of OMR Sheets will be hosted on the Commission's Website (<https://www.tspsc.gov.in>) for reference. Candidates by entering the required Login credentials can download the Images of OMR Sheets. Candidates are advised to retain their Images of OMR Sheets for future purpose until completion of the recruitment process. Duplicate Images of OMR Sheets will not be issued under any circumstances.

**PARA-IX: PROCEDURE OF SELECTION:**

- 1) **Pattern of Examination** will be as per G.O. Ms. No. 55 General Administration (Ser.A) Department, Dt. 25/04/2022.
- 2) The Selection of Candidates for appointment to the posts will be made by Written Examination (Objective Type) by CBRT/ OMR Based and the Selection for the posts will be based on marks secured in the written examination.
- 3) Those candidates who qualify in the Written Examination in order of merit will be called for verification of Certificates, Community and Category wise for the vacancies available as required. The qualifying marks for selection of the candidates belonging to: OC, Ex-Service men, Sports men & EWS – not less than 40%, BCs - not less than 35% SCs, STs and PH – not less than 30%.

N.B.: Mere securing minimum qualifying marks does not vest any right in a candidate for being considered for selection

- 4) In the event of SC and ST candidates not coming up for selection with the minimum marks prescribed above for selection, their selection shall be considered on the basis of marks with reference to their performance in the written examination irrespective of the marks secured.
- 5) The appearance in all the paper/papers at the Written Examination is compulsory. Absence in any of the paper/papers will automatically render his/her candidature for disqualification.
- 6) Candidates have to produce Original documents and other particulars on the day of verification itself. If candidate fails to produce any of the required **original** certificates and if the particulars furnished by him / her in the Application do not tally with the Original documents produced him / her, then his / her candidature will be rejected/disqualified without any further correspondence. Those candidates who are called for verification of certificates should furnish their order of preference of Multi-Zones, Subjects by exercising Web-Options and submit at the time of verification of certificates, which are final, failing which his/her candidature shall not be considered for further selection process. The selections will be confined only to the web options exercised by the candidates. Under no circumstances he/she will be considered for the posts /places where preference was not indicated.

- 7) The candidates will be selected and allotted to Multi-Zone as per their merit and order of Preference (**web-options**) against the vacancies available.
- 8) The appointment of selected candidates will be subject to their being found medically fit in the appropriate Medical Examination, and if he/she is of sound health, active habits free from any bodily defect or infirmity.

**PARA-X: DEBARMENT:**

- a) Candidates should make sure of their eligibility to the posts applied for and that the declaration made by them in the format of application regarding their eligibility is correct in all respects. Any candidate furnishing incorrect information or making false declaration regarding his/her eligibility at any stage or suppressing any information is liable to be debarred from appearing for any of the examinations conducted by the Commission, and for summarily rejection of candidature for this recruitment.
- b) The Commission is vested with the constitutional duty of conducting recruitment and selection as per rules duly maintaining utmost secrecy and confidentiality in this process and any attempt by anyone causing or likely to cause breach of this constitutional duty in such manner or by such action as to violate or likely to violate the fair practices followed and ensured by the Commission will be sufficient cause for rendering such questionable means as ground for debarment and penal consequences as per law and rules and as may be decided by the Commission.
- c) Any candidate is or has been found impersonating or resorting to any other irregular or improper means in connection with his / her candidature for selection or obtaining support of candidature by any means, such a candidate may in addition to rendering himself/ herself liable to criminal prosecution, will be debarred permanently from any exam or selection held by any Public Service Commission in the country.
- d) If he/she himself/herself or through relations or friends or any others has canvassed or endeavored to enlist for his candidature extraneous support, whether from official or non-official sources for appointment to any State Service or Subordinate Service shall be disqualified.
- e) The applicants are not allowed to bring any Electronic devices or Gadgets such as Smart / Mobile Phones, Calculators, Tablets, iPad, Bluetooth, Pagers, Programmable Devices or Storage Media like Pen-drive, Smart Watches, Camera etc., or any other equipment or related accessories either in working or switched off mode capable of being used as a communication device during the examination. 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 and applicants are advised not to bring any of the banned items including mobile phones to the venue of the examination, as arrangement for safe – keeping cannot be assured.
- f) Any infringement / unfair means of the above instructions as per Act No. 25/1997 shall entail disciplinary action published in State Gazette No. 35, Part–IV-B Extraordinary Dt. 21/08/1997 (as adapted by the Telangana Adaptation of Laws Order, 2016) if noticed, at any stage of the Recruitment shall be punishable with imprisonment for a term which shall not be less than three years but which may extend upto seven years and with fine which shall not be less than Rupees Five Thousand, but which may extend upto Rupees One Lakh.

**PARA-XI:-** (A) Please read the following Annexures appended to the Notification before filling the application form.

Annexure-I	Breakup of Vacancies
Annexure-II	Payment gateway
Annexure-III	Scheme and Syllabus
Annexure-IV	Instruction to the Candidates
Annexure-V	List of Communities
Annexure-VI	List of the recognized sports

**(B) MEMORANDUM OF MARKS:-** After Publication of results, the marks list (total marks) of the successful candidates will be displayed on the Commission's Website. However, Memorandum of Marks can be obtained after one month from the date of declaration of selection list in TSPSC website on payment of Rs.200/- (Rupees Two Hundred Only) through IPO/DD in favour of the Secretary, T.S. Public Service Commission, Hyderabad, for a period of Three Months only. Rejected, Invalid, disqualified, ineligible candidates will not be issued any Memorandum of Marks and fees paid by such candidates, if any, will be forfeited to Government account, without any correspondence in this regard. Requests for memorandum of marks, will not be entertained until the recruitment process is finalized.

**PARA XII: SPECIAL INSTRUCTIONS TO CANDIDATES:**

Candidates are directed to follow the Commission's Website (<https://www.tspsc.gov.in>) regularly to know the latest developments of this Recruitment and any changes/ Modifications/ Addendum/ Corrigendum, dates of Examination, calling of candidates for verification of Certificates/ Results etc. Candidates may note that individual communication is not possible. Hence, they must regularly visit the TSPSC website for updates such as Edit option, Schedule of Examination and Hall Tickets, Merit List, List of candidates shortlisted for Certificate Verification, schedule of certificate verification / Medical board, etc.

**Candidates are advised to go through the Instructions to Candidates enclosed to this Notification at Annexure-IV.**

**PARA-XIII: 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 candidate 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 or withdraw the Notification at any time, 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**  
**DATE: 07/12/2022**

**Sd/-**  
**SECRETARY**

**ANNEXURE – I**

**BREAK-UP OF VACANCY POSITION FOR THE POST LECTURERS IN GOVERNMENT POLYTECHNICS IN TECHNICAL EDUCATION SERVICE**

**PC.NO. 01:- LECTURER IN AUTOMOBILE ENGINEERING**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	
MZ-I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MZ-II	04	02	01	-	-	01	-	01	01	-	-	-	-	-	01	01	01	01	-	01 (VH)	-	-	08	07	15
TOTAL	04	02	01	-	-	01	-	01	01	-	-	-	-	-	01	01	01	01	-	01	-	-	08	07	15

**PC.NO. 02:- LECTURER IN BIOMEDICAL ENGINEERING**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	
MZ-I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MZ-II	01	01	-	-	-	-	-	-	-	-	-	-	-	-	01	-	-	-	-	-	-	-	01	02	03
TOTAL	01	01	-	-	-	-	-	-	-	-	-	-	-	-	01	-	-	-	-	-	-	-	01	02	03

**PC.NO. 03:- LECTURER IN CHEMICAL ENGINEERING**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	
MZ-I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MZ-II	-	01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	01	01
<b>TOTAL</b>	-	<b>01</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>01</b>	<b>01</b>

**PC. NO. 04:- LECTURER IN CIVIL ENGINEERING**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	
MZ-I	07	04	02	01	02	01	01	01	01	-	-	01	-	01	03	02	02	02	01 (HH)	01 (VH)	-	-	19	14	33
MZ-II	10	06	03	01	02	02	02	02	01	-	02	01	01	01	04	03	03	02	01 (HH)	01 (VH)	01	-	30	19	49
<b>TOTAL</b>	<b>17</b>	<b>10</b>	<b>05</b>	<b>02</b>	<b>04</b>	<b>03</b>	<b>03</b>	<b>03</b>	<b>02</b>	-	<b>02</b>	<b>02</b>	<b>01</b>	<b>02</b>	<b>07</b>	<b>05</b>	<b>05</b>	<b>04</b>	<b>02</b>	<b>02</b>	<b>01</b>	-	<b>51</b>	<b>31</b>	<b>82</b>

**PC. NO. 05:- LECTURER IN ELECTRICAL AND ELECTRONIC ENGINEERING**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL	
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W		
MZ-I	02	01	-	-	-	01	-	-	-	-	-	-	-	-	-	01	-	-	-	-	-	-	-	02	03	05
MZ-II	04	02	01	01	-	01	-	01	01	-	-	01	-	01	02	01	01	01	--	01 (VH)	--	-	09	10	19	
<b>TOTAL</b>	<b>06</b>	<b>03</b>	<b>01</b>	<b>01</b>	<b>-</b>	<b>02</b>	<b>-</b>	<b>01</b>	<b>01</b>	<b>-</b>	<b>-</b>	<b>01</b>	<b>-</b>	<b>01</b>	<b>02</b>	<b>02</b>	<b>01</b>	<b>01</b>	<b>-</b>	<b>01</b>	<b>-</b>	<b>-</b>	<b>11</b>	<b>13</b>	<b>24</b>	

**PC. NO. 06:- LECTURER IN ELECTRONICS AND COMMUNICATION ENGINEERING**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	
MZ-I	04	02	01	01	-	01	-	01	01	-	-	01	-	01	02	01	01	01	-	01 (VH)	-	-	09	10	19
MZ-II	05	02	01	01	01	01	-	01	01	-	-	01	-	01	02	02	01	01	-	01 (VH)	-	-	11	11	22
<b>TOTAL</b>	<b>09</b>	<b>04</b>	<b>02</b>	<b>02</b>	<b>01</b>	<b>02</b>	<b>-</b>	<b>02</b>	<b>02</b>	<b>-</b>	<b>-</b>	<b>02</b>	<b>-</b>	<b>02</b>	<b>04</b>	<b>03</b>	<b>02</b>	<b>02</b>	<b>-</b>	<b>02</b>	<b>-</b>	<b>-</b>	<b>20</b>	<b>21</b>	<b>41</b>

**PC. NO. 07:- LECTURER IN ELECTRONICS AND INSTRUMENTATION ENGINEERING**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	
MZ-I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MZ-II	-	01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	01	01
<b>TOTAL</b>	-	01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>01</b>	<b>01</b>

**PC. NO. 08:- LECTURER IN FOOTWEAR TECHNOLOGY**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	
MZ-I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MZ-II	02	01	-	-	-	01	-	-	-	-	-	-	-	-	01	-	-	-	-	-	-	-	02	03	05
<b>TOTAL</b>	02	01	-	-	-	01	-	-	-	-	-	-	-	-	01	-	-	-	-	-	-	-	<b>02</b>	<b>03</b>	<b>05</b>

**PC. NO. 09:- LECTURER IN LETTER PRESS (PRINTING TECHNOLOGY)**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	
MZ-I	-	-	-	-	-	-	-	-	-	-	--	-	--		--	-	-	-	-	-	-	-	-	-	-
MZ-II	02	01	-	-	-	01	-	-	-	-	-	-	-	-	-	01	-	-	-	-	-	-	-	02	03
<b>TOTAL</b>	<b>02</b>	<b>01</b>	-	-	-	<b>01</b>	-	-	-	-	-	-	-	-	-	<b>01</b>	-	-	-	-	-	-	<b>02</b>	<b>03</b>	<b>05</b>

**PC. NO. 10:- LECTURER IN MECHANICAL ENGINEERING**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	
MZ-I	6	3	1	1	1	1	1	1	1	-	-	1	-	1	2	2	2	1	-	1 (VH)	-	-	14	12	26
MZ-II	2	1	1	-	-	1	-	1	-	-	-	-	-	-	1	1	-	1	-	1 (VH)	-	-	4	6	10
<b>TOTAL</b>	<b>8</b>	<b>4</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>-</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>18</b>	<b>18</b>	<b>36</b>

**PC. NO. 11:- LECTURER IN METALLURGY**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL	
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W		
MZ-I	1	1	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	3	4
MZ-II	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
TOTAL	1	2	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	4	5

**PC. NO. 12:- LECTURER IN PACKAGING TECHNOLOGY**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL	
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W		
MZ-I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MZ-II	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	2	3
TOTAL	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	2	3



**PC.NO. 15:- LECTURER IN ARCHITECTURE ENGINEERING**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL	
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W		
MZ-I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MZ-II	01	01	-	-	-	01	-	-	-	-	-	-	-	-	-	01	-	-	-	-	-	-	-	01	03	04
<b>TOTAL</b>	<b>01</b>	<b>01</b>	-	-	-	<b>01</b>	-	-	-	-	-	-	-	-	-	<b>01</b>	-	-	-	-	-	-	-	<b>01</b>	<b>03</b>	<b>04</b>

**PC NO. 16:- LECTURER IN PHARMACY**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL	
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W		
MZ-I	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	2
MZ-II	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	2
<b>TOTAL</b>	-	<b>2</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>2</b>	-	-	-	-	-	-	-	-	<b>4</b>	<b>4</b>

**PC NO. 17:- LECTURER IN GEOLOGY**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	
MZ-I	-	01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	01	01
MZ-II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	-	01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	01	01

**Pc. No. 18:- LECTURER IN CHEMISTRY**

MULTI ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	
MZ-I	-	01	-	-	-	-	-	-	-	-	-	-	-	-	-	01	-	-	-	-	-	-	-	02	02
MZ-II	02	01	-	-	-	01	-	-	-	-	-	-	-	-	-	01	-	-	-	01 (VH)	-	-	02	04	06
TOTAL	02	02	-	-	-	01	-	-	-	-	-	-	-	-	-	02	-	-	-	01	-	-	02	06	08

**PC. NO. 19:- LECTURER IN PHYSICS**

MULIT ZONE	OC		EWS		BC-A		BC-B		BC-C		BC-D		BC-E		SC		ST		PH		SPORTS		TOTAL		GRAND TOTAL	
	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W	G	W		
MZ-I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MZ-II	2	1	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2	3	5
<b>TOTAL</b>	2	1	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	3	5	

**ANNEXURE-II**

**LIST OF BANKS FOR MAKING ONLINE PAYMENT**

<b>Sl. No.</b>	<b>Name of the Bank</b>
1	Andhra Pragathi Grameena Bank
2	A U Small Finance Bank
3	Bandhan Bank
4	Bank of Bahrain and Kuwait
5	Bank of Baroda
6	Bank of India
7	Bank of Maharashtra
8	Bassien Catholic Coop Bank
9	Canara Bank
10	Capital Small Finance Bank
11	Catholic Syrian Bank
12	Central Bank of India
13	City Union Bank
14	Cosmos Bank
15	DCB Bank
16	Deutsche Bank
17	Dhanlakshmi Bank
18	Digibank by DBS
19	Equitas Small Finance Bank
20	ESAF Small Finance Bank
21	Federal Bank
22	Fincare Bank
23	Gujarat State Co-operative Bank Limited
24	HDFC Bank
25	HSBC Retail Net Banking
26	ICICI Bank
27	IDBI Bank
28	IDFC FIRST Bank
29	Indian Bank
30	Indian Overseas Bank
31	Indus-Ind Bank
32	Jammu & Kashmir Bank
33	Jana Small Finance Bank
34	Janata Sahakari Bank Ltd Pune

<b>Sl. No.</b>	<b>Name of the Bank</b>
35	Kalyan Janata Sahakari Bank
36	Karnataka Bank Ltd
37	Karnataka Gramin Bank
38	Karnataka Vikas Grameena Bank
39	Karur Vysya Bank
40	Kotak Bank
41	Laxmi Vilas Bank
42	Maharashtra Gramin Bank
43	Mehsana urban Co-op Bank
44	NKGSB Co-op Bank
45	North East Small Finance Bank Ltd
46	Nutan Nagarik Sahakari Bank Limited
47	Punjab & Sind Bank
48	Punjab National Bank
49	RBL Bank Limited
50	Saraswat Bank
51	SBM Bank India
52	Shivalik Mercantile Cooperative Bank Ltd
53	South Indian Bank
54	State Bank of India
55	SVC Co-operative Bank Ltd
56	Tamil Nadu State Co-operative Bank
57	Tamilnad Mercantile Bank Ltd.
58	The Kalupur Commercial Co-Operative Bank
59	The Surat People's Co-operative Bank Limited
60	The Sutex Co-op Bank Ltd
61	T J S B Bank
62	UCO Bank
63	Union Bank of India
64	Utkarsh Small Finance Bank
65	Varachha Co-operative Bank Limited
66	YES Bank Ltd
67	Zoroastrian Co-Operative Bank Ltd

**ANNEXURE-III****SCHEME AND SYLLABUS FOR RECRUITMENT TO THE POST OF LECTURERS IN  
GOVERNMENT POLYTECHNICS IN TECHNICAL EDUCATION SERVICE****SCHEME OF EXAMINATION**

<b>Written Examination (Objective Type)</b>		<b>No. of Questions</b>	<b>Duration (Minutes)</b>	<b>Marks</b>
Paper – I	General Studies and General Abilities	150	150	150
Paper – II	Concerned Subject	150	150	300
<b>TOTAL MARKS</b>				<b>450</b>

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

<b>LIST OF CONCERNED SUBJECTS</b>	
1. Architectural Engineering	11. Geology
2. Automobile Engineering	12. Letter Press (Printing Technology)
3. Bio-Medical Engineering	13. Mechanical Engineering
4. Chemical Engineering	14. Metallurgy
5. Chemistry	15. Packaging Technology
6. Civil Engineering	16. Pharmacy
7. Electrical and Electronics Engineering	17. Physics
8. Electronics and Communication Engineering	18. Tannery (Leather Technology)
9. Electronics and Instrumentation Engineering	19. Textile Technology
10. Footwear Technology	

## 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. (10<sup>th</sup> class Standard)

### PAPER – II: CONCERNED SUBJECT

#### 1. ARCHITECTURAL ENGINEERING (DEGREE LEVEL)

**Basic Design: Design definition and description, Importance of Design, Fundamental elements of Design, Principles of design, Colour Theory, elements of composition, Anthropometrics Study, Ergonomics, Study of Different spaces, Optimum areas for various functions, Space standards, Lighting and Ventilation standards for various activities, Design Process and thinking and Introduction to the study of aesthetics.**

**Building Materials:** Clay Bricks, Stones, Sand, Mortars, Cement, Concrete, Reinforced cement concrete, Timber, Veneers, Paints and Varnishes, Glass, Rubber, Adhesives, Asphalt & Bitumen, Plastics, Roofing & Flooring Materials, Metals, Alloy Steels, Non-ferrous metals.

**Building Construction:** Foundations, Footings, Walls, Lintels, Carpentry & Joinery, Openings (doors & windows), Composite Masonry, Partition Walls, Staircases, Cladding, Sloping and flat roofs, Floorings, Structural steel work and Types of steel trusses

**Architectural Drawing & Graphics:** Importance of Scale, Different forms, Architectural representation of different objects, Solid geometry, Building Geometry – isometric, axonometric, etc., Types of Arches, Sciography, Perspectives, Rendering, visualization skills and importance of free hand drawing.

**Engineering Mechanics:** Simple stress and strain, Types of stresses, elastic limit, modulus of elasticity, Bending moment and shear forces, Moment of inertia, Deflection, Buckling & Crushing failures, Slenderness ratio, Torsion, Design of RCC & Steel Structures.

**Introduction of art and architecture:** Importance of art, Development and exploration of art, Relationship between art and architecture, Role of an architect in society, relationship with other consultants, Technical knowledge and expertise, Evolution of Shelter forms.

**History of Architecture:** Architectural development in Egypt, Greek, Roman, Early Christian, Romanesque, Gothic & Byzantine. Hindu & Islamic architecture. Influence of Industrial revolution on building materials, construction technology, characteristic styles of modern architecture, Arts and Crafts movement, Art Nouveau, Monumentalism, Expressionism and pioneers of Modern architecture and their contributions.

**Surveying and Site Studies:** Principles of Surveying, Traversing & Plain table surveying, Computation of Areas & leveling, Automated Surveying.

Water supply and Sanitary Engineering: Sources of water supply, Quality of water, Treatment of water, Distribution system of water, Collection and Treatment of refuse, Sewage, Principles of drainage, plumbing and Sanitary fittings and fixtures, Roads & Pavements.

Climatology: Building Climatology, Tropical Climates, Thermal Comfort, Heat flow, Natural ventilation, Passive cooling, Sun & Design Process.

Landscape design and site planning: Importance and role of landscape designing, Historical Perspective, Elements in Landscape design, Plants and design, Landscape construction.

Building Services: Electrical Services, Lighting, Air Conditioning, Elevators and Escalators, Telephones and EPABX, Security systems, Fire fighting systems, Swimming pools, Energy sources of building: wind energy, photo voltaic, Bio-mass, Waste Disposal: Industries & Hospitals, Hotel services and Elevated flooring, Green Building Concepts: Energy conservation, net zero energy consumption.

Sociology of Human settlements: Sociological aspects, Elements of society, Urbanization, Historic Evolution, Transportation and communication, Principles of ekistics.

Economics, Estimating and Costing: Introduction on economics, Micro and Macroeconomics, economic issues, Financing of a project, Quantity surveying and estimating (approximate and detailed) and rate analysis.

Town Planning: Town forms in urban planning and development processes, various levels of planning: national, regional, urban, rural, local etc., objectives of town planning, O-D surveys, F.S.I. planning of industrial and recreational areas, urban renewals, TCPO and Town planning organization in India and Geographical information systems (GIS).

Building Acoustics: Need to study acoustics, history of acoustics, generation, propagation, transmission of sound, characteristics of sound, sensibility of human ear, resonance, reverberation time, sabine's formula, echoes, principles of acoustical design process and sound isolation.

Advances Construction: Decay and Damage, Building Failures, Maintenance and Renovation, Guniting, Strutting, Underpinning, Grouting, Propping, Effect of ageing, Weathering.

Professional Practice: Types of offices for practice, COA registration and rules, IIA Code professional conduct, architects duties, principles of Indian contract act, Tenders, Contracts, Easements, Arbitration, Valuation, Role of Consultants, Building Bye-laws, National Building Code, Consumer protection act, transfer of property.

Computer Applications: Hardware and Software requirements, Operating systems, Features of presentation package, drafting packages, benefits of Internet technology, visualization software and building information modeling (BIM).

## 2. AUTOMOBILE ENGINEERING (DEGREE LEVEL)

### 01. Heat Transfer and Thermodynamics:

Heat Transfer: Conduction – Convection - Thermal Radiation - Heat Exchangers.

Thermodynamics: Concepts of Thermodynamics – Zeroth Law of thermodynamics – First law of thermodynamics – Second Law of thermodynamics – Entropy – Thermodynamic Processes and Air standard cycles.

**02. Automobile Power Plants:** I.C. Engines – Combustion in I.C. Engines and Combustion chambers – Fuel supply systems in S.I and C.I engines – Inlet and Exhaust systems – Automobile pollution and control systems – I.C Engine performance – Scavenging, super charging and Turbo charging of Engines – Lubricants and Lubrication systems – Engine Coolants and Cooling systems - Modern developments in I.C. Engines.

**03. Strength of Materials:** Simple stress and strain – Temperature stresses – Geometrical properties – Shear force and Bending moment – Theory of simple bending – Theory of Torsion – Deflection of beams.

**04. Fluid Mechanics and Hydraulic Machinery:** Fluid properties – Flow of Fluids - Flow past immersed bodies – Oil power Hydraulic systems – Hydraulic Machinery.

**05. Automobile Instrumentation:** Electronic components used in an automobile – Sensors & Transducers: Flow measurement - Temperature measurement – Speed measurement – Pressure measurement – Distance measurement.

**06. Automobile Chassis and Body Engineering:** Frames & Chassis layout – Types of automobile bodies – Body constructional materials – Body constructional details and Ergonomics - Body Production methods – Aerodynamics – Automobile air conditioning, Heating and Ventilating systems – Interior and Exterior Trimming – Noise and Acoustic insulation - Wind screens.

**07. Automobile Transmission and Control systems:** Automobile Transmission systems – Wheels, Tyres and tubes - Steering system - Wheel balancing and alignment – Braking system – Suspension system – Traction control systems – Safety systems.

**08. Automobile Electrical Systems:** Electricity and Magnetism – Electromagnetic Induction – Batteries – Self starter and Drive mechanisms – Generating Systems: D.C Generator - Voltage Regulator, Current regulator, Cut-out relay – Alternators, Electronic Voltage regulator – Ignition systems - Dash board Instruments and Gauges - Automobile illumination and Accessories – Automobile wiring systems: General Color coding of wires used, Wiring harness and earth return systems.

**09. Material Science:** Crystallography of metals – Binary alloys – Constitution and equilibrium diagrams – Methods of studying metal structure – Heat treatment - Non Ferrous metals and alloys – Destructive and Non destructive Tests.

**10. Kinematics and Dynamics of Machines:**

Kinematics – Velocity and Acceleration – Properties of instantaneous centre – Gears & Gears trains – Cams – Governors – Brakes and dynamometers – Clutches – Power transmission – Belt and Chain drives.

Dynamics of Machines: Static force Analysis – Dynamic Force Analysis – Dynamics of Reciprocating Engines – Balancing – Vibration Analysis of Single degree freedom systems – Torsional Vibrations – Vibration isolation.

**11. Design of Automobile Parts:** Design of Riveted and welded joints - Design of Bolts & Nuts – Shafts and Axles – Springs – Bearings – Clutches – Brakes – Design of engine components: Piston - Connecting rod – Crank shaft - Fly wheel.

**12. Production Technology:** Machine tools – Lathes – Shaper, planner and slotting machines – Drilling and boring machine – Milling – Grinding & Lapping– Welding – Brazing – Foundry – Modern machining Trends.

**13. Industrial Engineering & Management:** Industrial management – Personnel Management – Production Management – Production Planning and control – Wages and incentives – Cost Control – Quality management - Marketing and Sales Promotion.

**14. Electric vehicles:** Types and systems, Types of electrical motors used as drive motors and relative advantages and limitations – Charging methods – Electronic controller – Regenerative braking system – Hybrid vehicles: Types and systems.

**15. Transport Management and Legal aspects of Motor Transport:** Organisational structure – Operations – Planning of the fleet – Bus and Crew scheduling – Transport economics – Fare collection and Fare fixation methods – Legal aspects of Motor Transport.

**16. Farm tractors:** Classification of tractors – Main systems or assemblies of tractors – P.T.O systems in Tractors – Depth and draft control in tractor –Draw bar and its setting at exact height – Types of hitches – Hitching of implements.

**17. Special Purpose Vehicles:** Earth movers: Shovels – Backhoe – Dragline – Scrapers - Bull Dozers - Comparison between wheel dozer and Crawler dozer – Dozer blades - Mobile cranes – Dumpers.

**18. Automobile Electronics:** Electronic fuel systems – Electronic steering systems – Electronic Suspension systems – Computerized instrument systems – GPS system – CAN communication system – Engine Management: Electronic Control Unit (ECU) – Engine control module – Tyre pressure monitoring system – Immobilizer – Central locking systems.

**19. Automobile Servicing and Maintenance:** Automobile Service Station Equipment - Types of Maintenance – Machines and equipments used for Servicing and Re-conditioning – Servicing, Maintenance and Trouble diagnosis charts of various automobile systems.

### 3. BIO-MEDICAL ENGINEERING (DEGREE LEVEL)

Respiratory Measurements and Aid; Principles and techniques of impedance pneumography and pneumotachograph.

Ventilators : Parameters, system Concepts, Flow Gauges, Valves Humidifiers. Birds, Emerson, Bear Ventilators.

Audiometry: Common Tests and procedures, Air-conduction, Bone Conduction, Masking, Schematic Functional Diagram of an Audiometer.

Electro-Surgical Equipment: Electro - Surgical Units: Principles of Cutting, Coagulation, Spark Gap, Valve Transistorized Generators, Safety Features.

Laser: Basic Principles of Laser, Different types of Laser Equipment used in Surgery, Safety.

Fibre Optics: Principles and Applications: Endoscopes, Neonatal instrumentation, Incubators, Ophthalmic Instrumentation: Intra - ocular Pressure Measurement, Contacting and Non-contacting Types, Refractometers.

Anesthesia Equipment, Boyle's Apparatus, Gas Distribution Systems.

Ultrasound Applications for Surgery: Lithotripsy, Principles and Applications.

Introduction to Bio-Medical Instrumentation. General Characteristics of medical instrumentation like linearity, range, frequency response, signal-to-noise ratio and stability.

Amplifiers for Bio-Medical applications: Differential, Carrier amplifiers, Instrumentation amplifier, Isolation amplifier. Phase sensitive detector for LVDT. Principles of wave generation and shaping. Recorders and play devices for Bio-Medical applications. General features of ink-jet, thermosensitive and optical recorders. General features of display devices for bio-signals. Significance of non-fade display, Data acquisition and display using micro computers. ECG recording system. Block schematic diagram of ECG machine; amplifiers: circuits for ECG. Special types of ECG recorders. Noise problems and their elimination.

Electro-encephalography: Block schematic diagram of EEG recording system. General features of different blocks : specification of EEG amplifiers : qualitative requirements, 10-20 electrode system, Resting Rhythms and sleep stages.

Electro Myography: Block schematic diagram of EMG recording system. Measurement of nerve conduction velocity, EMG amplifiers. Design considerations of EMG amplifiers. Data display for EMG.

Blood Pressure and blood flows. Electronic techniques for indirect and direct measurement of blood pressure: measurement of blood flow by electromagnetic, doppler and plethysmographic methods.

Phonocardiography: Origin of heart sounds. Phonocardiographic instrumentation consisting of microphone, filters and signal conditioners.

Introduction to Radiography: Physical properties of; X-rays. Principles of generation of X-rays. Radiation energy distribution. Collimators and grids, Fluoroscopy. Image intensifiers. Digital X-ray system, Digital Mammographic X-ray Equipment.

Methods of Chemical analysis: Absorption photometry: Emission photometry; Fluorometry, Beer-Lamberts Law, Introduction to autoanalyzer. Chromatography for blood gas analysis, Colorimeters., Spectrophotometers, Electrophoresis, Principle of pH meter.

Electrical hazards during Bioelectric monitoring: safety, Codes, Standards. Micro and Macroshock and their physiological effects. Leakage currents and protection by use of isolation transformers. Equipotential grounding and earth free monitoring.

Electrical factors in Hospital Design : Electrical power supply systems in a hospital building, Proper installation and grounding for providing safety to the patient - electrical environment.

Ultrasonics: Basic principles of Medical Ultrasonics, Echo Techniques, Functional Block Diagram of Basic Pulse-Echo System for Diagnostic Purposes. Different Display Modes A-Mode, B-Mode, M-Mode, Types of Scan-B Scan, Principles of Echocardiography and Echoencephalography with Schematic Block Diagrams. Sector Scanners, and phased array scanners.

Introduction to Doppler Ultrasound, Blood flow through heart valves, peripheral vessels - Doppler flow meter. Display Devices for Ultrasonic Echo Imaging. Biological Effects of Ultrasound and Safety Precautions.

Magnetic Resonance Imaging: Basic Principles of Magnetic Resonance Imaging. Signal Excitation and Detection. Schematic Functional Diagram of MRI Scanner with its sub-systems. Magnet, Gradient system. R.F. Transmitter Receiver system, Computer and Image Display, Reconstruction Techniques, Medical Applications and safety precautions.

Computed Tomography: Basic Principles, System Components and Functions of Scanning System, Processing Unit, CT- Generations, CT-Detectors, Reconstruction Techniques - Viewing systems, storage and documentation. Medical applications and safety precautions.

Radio Nuclide Imaging: Principle, Radio-Isotopes in medical diagnosis, Radiation detectors, Pulse height Analyzers, Schematic functional diagram and Components of Gamma Camera. Medical Applications, safety and precautions.

Medical Thermography: Basic Principle, Functional Block Diagram of thermo graphic equipment, scanning and display arrangements for Infra-Red Imaging, Medical applications.

Position emission tomography: Basic Principles, Nuclear Reactions and production of precursors. Detector Materials reconstruction techniques. Principle of SPECT and applications.

Defibrillators: D.C. Defibrillators of capacitive discharge and delay line capacitive discharge with basic circuit diagrams. Types of electrodes and their features. Implantable Defibrillators, Testing and safety.

Cardioverters: Working Principles, Scheme of synchronizing D.C. Defibrillators with the R-wave of ECG. Testing and safety. Cardiac pacemakers: Types -

- i. Asynchronous and Synchronous (demand) mode of operation.
- ii. External and implantable, Asynchronous Pacemakers.

Working principles, block diagram and circuit diagram of blocking oscillator asynchronous pacemaker.

Synchronous / Demand Pacemaker: Working principles, modes of triggering-ventricular triggered (QRS triggered) and atrioventricular synchronized pacemaker (P wave triggered).

Implantable pacemaker: Technical and qualitative requirements of power supplies, lead wires and electrodes. Transcutaneous R.F. powered Cardiac pacemaker system. Susceptibility of implanted pacemaker to electrical interference and remedial measure. Assist Devices for the Heart: Principles of external counter-pulsation techniques. Infra-aortic Balloon pump. Auxiliary ventricle and schematic for temporary by-pass of left ventricle.

Biomaterials: Significance of Biocompatibility, Types of biomaterials, in-vitro, in-vivo testing of biomaterials, Factors influencing implants, Orthopedic Implants, Ophthalmic & Dental applications of Biomaterials.

Prosthetic Heart Valves: Qualitative requirements. Categories Mechanical and tissue valves. Types of mechanical Valves - ball and cage, tilting disc and bi-leaflet valves. Types of tissue valves - Homograft or allograft (human cadaver) and Heterografts or Xenografts (Porcine or Bovine). In vitro performance testing of prosthetic heart valves using a pulse duplicator.

Heart- Lung Machine: Governing principles, qualitative requirements, functional details of bubble, thin film and membrane - Type of blood oxygenators.

Hemodialyzer: Qualitative requirements. General Scheme of operation. Types of Exchangers, block diagram, electronic control and monitoring systems.

Intensive Coronary Care Concepts: Systems organization, Critical Physiological parameters to be monitored. Bedside patient monitors, central station, Apnoea monitor, Layout and safety precautions.

Physical Therapy Equipment. Short wave, Microwave and Ultrasonic diathermy. Electrical stimulators.

Nernst equation - derivation and its significance. Refractory period. Characteristics of stimulus. Strength-duration relationship. Electrical equivalent circuit of an axon. Membrane time and space constants. Hodgkin Huxley formulation. Membrane conductance. Nerve conduction membrane properties from current voltage relations, models of squid axon. Propagation of impulses in unmyelinated and myelinated nerve fibre. Electrical properties of receptors. Generator potential of Receptors. Intensity-frequency relationship. Electrical properties of synaptic junctions - EPSP and IPSP.

Electrical Activity of the heart. Conduction system of the heart. Characteristics of Action potentials at SA node, AV Node, Purkinje fibres and ventricles, ECG complexes. The international standard 12 leads of ECG. Standard leads of Einthoven, precordial leads and augmented limb leads. Relationship between unipolar leads and standard bipolar leads. Volume conductor fields: Bio-electric sources, Volume-conductor formulation. Solid angle computation. Infinite cylindrical axon, core conductor model non-homogeneous media, integral equations.

Electrical activity of skeletal muscles-motor unit potentials. EMG wave form. Surface and needle electrodes for EMG. Velocity and their changes in normal and abnormal states. Fatigue and conduction - chemical significance.

Introduction to bioelectric Phenomena of hearing - Mechanical equivalent schematic diagram of the ear. Mechanical transformer of the middle ear. Frequency analysis of sound by the basilar membrane. Cochlear microphonics.

Interaction between Engineering and life sciences. Definition of Biomedical Engineering, its scope. The role of Biomedical Engineer in Health care delivery systems. Medical Electronics Industry Research, Development and education.

Application of Engineering concepts and methods for understanding Physiological systems. Basic electrical and Mechanical properties skeletal systems, muscular system, heart and brain. Nervous system as an internal communication system of the human body, Sense Organs.

Electrophysiology: Functional structure of a cell. Basis of biopotentials. Resting potential of a nerve cell and its ionic mechanisms. Properties of excitable membranes. Action potential generation, its ionic mechanism and its characteristics.

Physiological signals, Characteristics, Basis of ECG, EMG, EEG and qualitative treatment of instrumentation for measuring these signals.

Biopotential, Electrodes, Electrode - Electrolyte Interface. Internal electrodes like needle electrodes and microelectrodes.

Equivalent circuit Properties.

Transducers for physiological application. Static-types like variable R.L. & C, LVDT, Thermocouples, Thermistors Photo electric and Dynamic types like piezoelectric and moving coil type and their applications. Special requirements.

Development of instrumentation for Clinical practice and Medical Research, Introduction. Comparative study of industrial and Medical Instrumentation. Basic classification of Medical Instruments, Instrument characteristics, linearity, range, frequency response, signal to noise ratio and stability.

Broad classification of Biomedical Instrumentation for Clinical practice that is:

1. Instrumentation for Diagnosis, ECG, EEG, EMG, PCG etc.,
2. Therapeutic Devices - Stimulators, diathermy equipments etc.,
3. Prosthetic Devices - Pacemakers, Artificial Organs.
4. Visualizing Devices - X-ray, Ultrasound etc., fibre optic endoscope.
5. Electrosurgical Devices - HF Surgery, Laser Surgery.
6. Data Storage & Analysis - Computers in medicine.
7. Analytical Instruments - Photocolorimetry, Spectrophotometer, Electrophoresis, Centrifuges, Waterbath etc., Hospital illumination, Theatre illumination, Requirements and typical arrangements. Miscellaneous equipment's.

#### 4. CHEMICAL ENGINEERING (DEGREE LEVEL)

1. Fluid Mechanics : Dimensional analysis, fluid statics, fluid flow phenomena, basic equations of fluid flow, flow of incompressible fluids in pipes – Newtonian and non-Newtonian fluids, viscosity, Bernoulli's theorem, friction losses, friction factor, Hagen–Poiseuille equation. Turbulent flow, Transportation and metering of fluids. Different types of pumps for transportation of fluids -Calculation of pump power for transportation of fluids, flow meters – orifice, Venturi and Rotameters. Flow past immersed bodies, fluidization - packed bed and fluidized bed.
2. Heat Transfer: Conduction in solids – Steady state and unsteady state. Heat flow in fluids – overall heat transfer coefficient, Log-mean temperature difference, calculation of individual heat transfer coefficient and overall heat transfer coefficient. Fouling factors, Heat transfer to fluids without phase change – Thermal boundary layer, heat transfer by forced convection in laminar flow and in turbulent flow, empirical equations; Heat transfer from condensing vapors. Types of heat exchange equipment, counter current and parallel current flows. Evaporation – liquid characteristics and important properties, types of evaporators, condensers, ejectors- evaporator economy- single and multiple effects –related problems. Radiation – fundamentals, emission of radiation, black body radiation, laws of black body radiation – radiation between surfaces.
3. Mass Transfer: Molecular diffusion in fluids, inter phase mass transfer, mass transfer coefficients, Distillation (binary system), gas absorption and adsorption, liquid-liquid extraction, leaching, humidification, drying and crystallization operations. Equipment for distillation, gas absorption, liquid-liquid extraction, drying, humidification and crystallization.
4. Reaction Engineering: Rate of reaction, variables affecting the rate of reaction. Interpretation of kinetic data in batch and flow systems. Theories of reaction rate, classification of reactors, design equations for batch and flow reactors, Catalysis.
5. Thermodynamics: First law of thermodynamics – Internal energy, Enthalpy, heat capacity, PVT relationships for gases, first law for open systems. Second law of thermodynamics – statement, entropy function, calculations of entropy changes. Free energy functions. Calculation of enthalpy and entropy as function of pressure and temperature, Heat effects. Criteria for equilibrium and their application.
6. Mechanical Operations: Size reduction, Properties, Handling and Mixing of particulate solids, laws of size reduction- crushers and grinders. Different types of equipments for mixing dry powders, differential and cumulative screen analysis, screen effectiveness, average particle size .Mechanical separations, Screening, Filtration, Sedimentation, froth floatation. Conveying and Storage of solids.
7. Process Technology : Manufacture of following chemical products in process industries – Location and uses – Water, Inorganic chemical industries (sulfuric acid, phosphoric acid, Soda ash, Caustic soda and Chlorine industry), fertilizers (Ammonia, Urea, SSP and TSP); natural products industries (Pulp and Paper, Sugar, Oil, and Fats); petroleum refining and petrochemicals ( Coal chemicals, coking of coal, coal tar distillation, petroleum refining-atmospheric distillation and vacuum distillation , fluid catalytic cracking , catalytic reforming , petrochemicals from methane and ethylene); polymerization industries (polyethylene, polypropylene, PVC and polyester synthetic fibres). Cement, Electro thermal industries; Calcium carbide, Silicon carbide, Graphite, Pigments and Paints.
8. Material and Energy Balances : Basic calculations, Determination of molarity, molality & normality, analysis of solids , liquids and gases on dry and wet basis , Daltons law , ideal gas equation of state , vapor pressure boiling point and freezing point , elevation of boiling point and depression of freezing point-uses, Bypassing ,Recycling & purge streams – uses , limiting component , excess reactant , percentage conversion & yield and degree of completion , Material balances with and without chemical reactions, law of conservation of energy , heat of reaction , heat of formation , and heat of combustion – related problems , gross and net calorific values , theoretical air and excess air calculations
9. Instrumentation and Process Control: Qualities of measurement, measurement of temperature, pressure and vacuum, liquid level, density and viscosity, composition and analysis. Process control \_ Automatic process control – Elements of a control system-Static and dynamic characteristics of an instrument – Controllers modes of control and its applications.
10. Material technology: Mechanical properties of metals and Testing of materials – thermal equilibrium diagram- Production of Iron-plain carbon steels, alloy steels - Miscellaneous materials – Glass, carbon, graphite, rubber, elastomers, fiberglass and FRP etc. – Corrosion causes, types, methods of prevention .
11. Environmental Studies and Pollution Control Engineering: Scope and importance of environmental studies, segments, Eco systems, bio diversity, water pollution, types, classification, treatment methods, air pollution, types, classification, analysis, control

methods, solid waste management, sources, classification, disposal, pollution control in sugar, fertilizer & petroleum industries, legal aspects.

12. Energy Technology & Plant Operation: Classification of energy sources-Solid, Liquid, and Gaseous fuels – Combustion principles, Refractories, Furnaces - Blast Furnace, LD Converter - Nuclear Energy, Solar Energy, Wind Energy and Bio-Energy – Energy Conservation - Industrial Hazards and Prevention -Safety and first AID.

## 5. CHEMISTRY (POST GRADUATE LEVEL)

### 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 diagram limitations, 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:

1. 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
2. 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 scale ionisation constant of weak acids and weak bases- relation between  $K_a$  and  $K_b$ . 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.
3. 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  $\Delta H$  and  $\Delta S$ . 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 equilibrium-derivation of equilibrium constant. Temperature dependence of equilibrium constant - The Van't Hoff equation.
4. 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.
  5. 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.
  6. 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.
  7. 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 ( $\Delta E_{ST}$ ). 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.
  8. 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:**

1. IUPAC nomenclature of organic molecules. Isomerism – classification of isomers.
2. Classification, preparations and properties of alkane, alkenes, alkynes, cyclo alkanes, aromatic hydrocarbons, halogen compounds, hydroxy compounds, carbonyl compounds, carboxylic acids and its derivatives.
3. Stereo chemistry: Molecular representations (Wedge, Fisher, Newman and Saw-horse projection formula) their description and interconversions. Stereoisomers – classification- 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, Z configuration, including aldoxime and ketoximes.
4. 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.
5. 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.
6. 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, Sommllett-Hauser and Smile rearrangement.
7. 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, pyrolytic syn elimination and a-elimination, elimination vs substitution. Detection of reaction mechanism by product isolation, isotopic labelling, chemical trapping and crossover experiments.
8. Oxidation- Swern, Cr (VI) oxidants, Oxidative cleavage of 1,2-diols - Periodic acid and Lead tetra acetate.
9. Reductions - Wilkinson's catalytic hydrogenation, LiAlH<sub>4</sub>, NaBH<sub>4</sub>, BH<sub>3</sub>, AlH<sub>3</sub> and DIBAL.
10. 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, Isoquinolines.
11. 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.
12. Organic photochemistry: photochemical energy, Frank-Condon principle, Jablonski diagram, Electronic transitions, photosensitization, quenching, quantum efficiency, quantum yield, photochemistry of carbonyl compounds n

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 transitions. Norrish type-I and Norrish type-II cleavages. Paterno-Buchi reactions, Photoreduction, photochemistry of enones- hydrogen abstraction, rearrangements of  $\alpha,\beta$ -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.
13. 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.

14. Basic principles, concepts of UV, IR, <sup>1</sup>H NMR, <sup>13</sup>C NMR and Mass spectroscopic methods – structure determination of organic compounds by UV, IR, <sup>1</sup>H NMR, <sup>13</sup>C NMR and Mass spectroscopic methods.
15. Green chemistry: Principles of Green chemistry, and its approaches.

## 6. CIVIL ENGINEERING (DEGREE LEVEL)

### 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; matrix methods of analysis.

### 3. Cement Concrete 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 concepts; 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 - $\phi$ -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 principles – classification and 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; Intersection – at grade and grade separated; Channelization; Rotary intersection; signal design – Webster method, traffic signs, pavement marking; Parking studies, accidental studies, 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 runway 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, Mohr's circle, 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; Cofferdams, 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, Trapezoidal method, Prismoidal Rule; Approximate estimate – Plinth area and cubic rate estimate.

#### **10. Construction Management:**

Types of construction projects, Tendering and construction contracts, project planning and network analysis – PERT and CPM.

#### **11. 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, components of GPS and basics of GIS.

## **7. ELECTRICAL AND ELECTRONICS ENGINEERING (DEGREE LEVEL)**

**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 in 3-phase 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, minimization of switching functions combinational and sequential logic circuits; schmitt 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, 8051 mc BASICS (Architectures. Addressing modes and instruction set).

**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.

## 8. ELECTRONICS & COMMUNICATION ENGINEERING (DEGREE LEVEL)

### Section-I

#### Engineering Mathematics

**Linear Algebra:** Vector space, basis, linear dependence and independence, matrix algebra, eigen values and eigen vectors, rank, solution of linear equations – existence and uniqueness.

**Calculus:** Mean value theorems, theorems of integral calculus, evaluation of definite and improper integrals, partial derivatives, maxima and minima, multiple integrals, line, surface and volume integrals, Taylor series.

**Differential Equations:** First order equations (Linear and Nonlinear), higher order linear differential equations with constant coefficients, method of variation of parameters, Cauchy's

and Euler's equations, initial and boundary value problems, partial differential equations and variable separable method.

**Complex Variables:** Analytic functions, Cauchy's integral formula: Cauchy's integral theorem, Taylor's and Laurent' Series, residue theorem.

**Probability and Statistics:** Probability, Joint and conditional probability, discrete and continuous random variables, probability distribution and density functions. Exponential, Poisson, normal and Binomial Distributions Functions. mean, mean square and standard deviation.

**Numerical Methods:** Solutions of non-Linear equations, single and multi-step methods for differential equations.

## Section-II

### Networks:

**Network solution methods:** Nodal and mesh analysis; Network theorems: superposition, Thevenin and Norton's, maximum power transfer; Wye-Delta transformation; Steady state sinusoidal analysis using phasors; Time-domain analysis of simple linear circuits; Solution of network equations using Laplace transform; Frequency domain analysis of RLC circuits; Linear 2-port network parameters: driving point and transfer functions; State equations for networks.

**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.

**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.

**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-III

**Digital circuits:** Boolean algebra, minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS).

**Combinatorial circuits:** arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs.

**Sequential circuits:** latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs. Semiconductor memories: ROM, SRAM, DRAM.

**Microprocessor (8085):** architecture, programming, memory and I/O interfacing.

**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.

**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.

**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.

**Tools and techniques for LTI control system analysis:** root loci, Routh-Hurwitz criterion, Bode and Nyquist plots.

## Section-IV

**Communications:** Random signals and noise: probability, random variables, probability density and distribution functions, Moments, autocorrelation, power spectral density.

**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.

**Digital communication systems:** Pulse Code Modulation (PCM), Differential Pulse Code Modulation (DPCM)

**Digital modulation schemes:** amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), QAM, matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. Basics of TDMA, FDMA and CDMA and GSM.

**Electromagnetics:** Maxwell's Equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector; plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth; Transmission Lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart; Waveguides: modes, boundary conditions, cut-off frequencies, dispersion relations. Antennas: antenna types, radiation pattern, gain and directivity, return loss.

## 9. ELECTRONICS AND INSTRUMENTATION ENGINEERING (DEGREE LEVEL)

1. **Fundamentals:** Coulomb's law – Ohms law – Faradays laws of electromagnetic induction, Kirchhoff's laws, Ampere's law Resistance, Capacitance and Inductance, Graph, tree and links – Loop currents, node voltages two port networks, Z, Y and Hybrid parameters. Alternating currents, RMS value, formfactor, R.L.C. in AC Circuits power; and power factor, network theorems – Harmonic analysis.
2. **Analog Electronics:** Characteristics and applications of diode, Zener diode, BJT and MOSFET; small-signal analysis of transistor circuits, feedback amplifiers. Characteristics of ideal and practical operational amplifiers; applications of op-amps: adder, subtractor, integrator, differentiator, difference amplifier, instrumentation amplifier, precision rectifier, active filters, oscillators, signal generators, voltage-controlled oscillators and phase-locked loop. 555 timer and applications
3. **Digital Electronics:** Combinational logic circuits, minimization of Boolean functions. IC families: TTL and CMOS. Arithmetic circuits, comparators, Schmitt trigger, multi-vibrators, sequential circuits, flipflops, shift registers, timers and counters; sample-and-hold circuit, multiplexer, analog-to-digital (successive approximation, integrating, flash and sigma-delta) and digital-to-analog converters (weighted R, R-2R ladder and current steering logic). Characteristics of ADC and DAC (resolution, quantization, significant bits, conversion/settling time); basics of number systems.
4. **Electrical and Electronic Measurements:** Indicating instruments, D-Arsonval type Galvanometer, Vibration Galvanometer, Ballistic Galvanometer, Measurement of resistance, AC Potentiometers, Wheatstone Bridge, Kelvin's bridge, AC Bridges, Maxwell's, Heaviside and Schering bridges.  
Cathode Ray Oscilloscope and its applications, Electronic Voltmeters – Balanced bridge type, transistor Voltmeter, Chopper amplifier type Voltmeter, High Frequency measurements.
5. **Process Instrumentation:** Fundamentals of Instrumentation, Static and dynamic characteristics of Measurement Systems. Error and uncertainty analysis. Statistical analysis of data and curve fitting. Transducers – Primary and Secondary – Classification of transducers, Basic transducer theory for the measurement of displacement, Temperature, Flow, Level measurement, Force and torque, Density and viscosity, Humidity- Nuclear instrumentation, Smart sensors, IR sensors, Motion detection sensors, accelerometer sensors, Gyroscope sensors.
6. **Control Systems and Process Control:** Feedback principles. Signal flow graphs. Transient Response, steady-state-errors. Routh and Nyquist criteria. Bode plot, root loci. Time delay systems. Phase and gain margin. State space representation of systems. Mechanical, hydraulic and pneumatic system components. Synchro pair, servo and step motors. On-off, cascade, P, P-I, P-I-D, feed forward and adaptive control.
7. **Analytical, Optical and Biomedical Instrumentation:** Mass spectrometry. UV, visible and IR spectrometry. X-ray and nuclear radiation measurements. Optical sources and detectors, LED, laser, Photo-diode, photo-resistor and their characteristics. Interferometers, Basics of fiber optics. Biomedical instruments, EEG, ECG and EMG. Clinical measurements. Ultrasonic transducers and Ultrasonography. Principles of Computer Assisted Tomography.

8. **Embedded Systems:** Microprocessor and microcontroller applications, memory and input-output interfacing; basics of data acquisition systems, basics of distributed control systems (DCS) and programmable logic controllers (PLC).

### 10. FOOT WEAR TECHNOLOGY (DEGREE LEVEL)

- Classification of Footwear, Leather goods, Garments based on construction, utilization, style-Upper Parts of Footwear, Bottom Parts of Footwear.
- Anatomy of Feet-Bones, Joints, Arches of the Foot –Changes during Growth-Functions of the Foot- Common Foot Troubles. – Reasons for foot problems – Deformed feet – Remedy.
- Foot Measurements- Foot drafting – Length and Girth Measurements-Different Footwear Sizing systems- Fittings and Multi Fittings-Conversion from one Sizing system to other system-Functions of the Feet.
- Lasts-Materials-classification of Lasts-Parts of the Last-Last Measurements –Last Terms-Last Functions-Comparison of Last and Feet-Different type of Hinges-Last Manufacturing- Grading.
- Footwear Designing -7 Basic Styles of Footwear- Mean form preparation-Footwear Styling-Design and Pattern Development of Sandals, Derby, Oxford, Slip on, Court shoe, Moccasin, Ankle Boot, Calf Boot, Knee boot, Grading – different grading systems – equipment used for grading- Footwear CAD software Packages, Different Functions available in Software.
- Clicking- Qualities required in a Clicker-Characteristics and Variation in Leather-Manufacturing/Quality Requirements-Methods of Clicking leather, Synthetics-Leather Measurement Systems.
- Pre fitting and Closing-Splitting-Identification Markings-Stitch markings-Press Punching-Perforating-Embossing-Skiving-Types of Skiving –Machines for Pre fitting and Closing Operations –Reinforcements-Top line and Edge Treatments-Stitching Machines-Lockstitch-Chain Stitch-Types of Seams-Decorative Stitching-Boxing and Barring Stitching-Eye letting- Threads –Needles-organizing of Closing.
- Footwear Materials-Different Type of Leathers -Soles-Insoles-Toe Puff- Stiffeners-Heels-Shanks-Adhesives-Threads-Needles- Linings-Synthetic Upper materials-Coated Fabrics-Poromerics-Knitted Fabrics-Woven, Non Woven Fabrics-Comparison of Leather and Synthetics- Leather Boards-Reinforcement Materials-Grinderies-Thermo Plastics, Comparison of Leather and non Leather Footwear .
- Bottoming operations-Conditioning of Upper before Lasting-Toe puff attaching-Counter stiffener attaching and Counter Moulding-Forepart lasting-Seat and Side Lasting-Heat Setting-Hot air blowing-Pounding –Wrinkle Chasing- Leather& Synthetic Upper Preparation for Sole Attaching , Leather& Synthetic Sole Preparation for Sole Attaching -Adhesive application- Sole attaching- heel attaching and Heel Nailing.
- Finishing Operations-Sole and Heel Finishing Operations-Heel Paring-Heel Scouring-Edge Paring- Edge Inking- Edge Setting- Heel Inking- Heel Burnishing- Sole Buffing – Sole Staining – Sole Finishing- Heel seat Wheeling- Other Sole and Heel Finishing Operations-Machines Used.
- Upper Finishing operations- upper Cleaning- Upper Conditioning- Upper Filling- Upper Dressing- Different Materials used- Different Machines Used- Finishing of Suede and Nubuck Leathers. Combined Finishing Machines-Making of Prefinished Leather Soles.
- Different Footwear Construction Methods-Cemented Construction- Veldtschoen Construction - Machine Welted Construction- Californian Slip Lasting Construction-String Lasting Constructions- Direct Vulcanizing Construction- Injection Moulding of PVC construction - Injection Moulding of PU Construction- Machines Used.
- Specialty Footwear –Leather Safety Shoes, Boots, Mining Safety shoes, Boots-Safety Rubber Canvas Boot for Miners-Steel Toecaps- Sports Footwear- Running Spikes, Track Shoe, Football boots, Tennis Shoes, Gymnastic Shoes, Orthopedic Footwear-Foot Problems-Materials used-Modifications required for different Foot Problems, Children Footwear Modifications , Casting the foot for Custom shoes.
- Testing – Sampling Position of Leather for Testing- Conditioning of Leather for Testing , Testing of Physical properties like tensile strength - % elongation at break stitch tear,

tongue tear strength, Flexural endurance test, Lasto meter tests, Grain crack Index, Real Density tests, Testing of Shrinkage Temperature, Absorption of Water, Dynamic Water Proofness Tests, Dry and Wet Rub Fastness test, Air and water Vapour Permeability tests, Leather Finish Tests, Abrasion Tests, Testing of Sole Materials, Various Types of Adhesive Failures-Sole Adhesion Tests, Tests on Adhesive Bond-Bond Development-Testing of Threads, Laces, Zips, Buckles- above test methods and their importance.

- Quality Control- Quality points to be inspected after Clicking, Splitting, Skiving, Upper Making, Lasting, Sole attaching, Final Inspection of Footwear Manufacturing.
- Leather Goods and Garments- materials used- Pattern Making and Fabrication Procedure of Small Leather Goods, Ladies bags, Brief Cases, Zip Folio Cases, - Fabrication of Suitcase, Holdals, Attaache Cases, -Garment Leathers, Material Used in Garment Fabrications- Basic Sleeve Block, Collars.
- Hand Tools used in Footwear Manufacturing, Leather Goods and Leather Garments Manufacturing- Carving and Stamping Tools, Finishing Tools.
- Foot wear Machines – Operating Principle of Clicking Machines, Pre Fitting Machines, Closing Machines, Lasting Machines, Bottoming Machines, Finishing Machines.
- Costing- Costing of Foot wear, Leather Goods, Garments- Different Methods used for Material Consumption Calculations.
- Leather Making-Operations involved in making Leather, Classification of Leather Based on Raw Material, Type of Tanning, Type of Finish- Defects in Leather- Selection of Leather for Different Use.

## 11. GEOLOGY (POST GRADUATE LEVEL)

**1. Geomorphology & Field Geology:** Fundamental concepts of geomorphology, Geomorphic processes, Weathering, soils, mass wasting, Streams and valleys, drainage patterns and their significance, groundwater, glacial cycle, wind, lakes, seas, earthquakes, volcanoes and mountains, application of geomorphology to various fields of earth sciences.

Field Geology: Toposheet, geological map, field work and sampling, compass, geological mapping procedures. Surveying Principles and methods surveying, chain survey, prismatic survey, plane table survey and theodolite survey. Dumpy's level.

**2. Crystallography, Mineralogy & Optical Mineralogy:** External symmetry of crystals: symmetry elements, classification of crystals into systems and classes, diffraction of crystals, Bragg's law. Physical properties of minerals, classification of minerals, structural and chemical principles of crystals / minerals, physical and optical characters and paragenesis of mineral groups- Olivine, pyroxene, amphibole, feldspars, quartz, chlorite, mica, spinel, epidote and garnet groups, optical properties of common rock forming silicate minerals.

**3. Structural geology and Geotectonics:** Stress-strain relationship of elastic, plastic and viscous materials. Principles of geological mapping, measurement of strike and dip, Structural analysis of folds, cleavages, lineation's, joints, and faults, superposed deformation, mechanism of folding and faulting, Unconformities, structural behavior of igneous rocks, diapirs and salt domes, fundamentals of petrofabric analysis.

Earth and solar system, planetary evolution of earth and its internal structure, Heterogeneity of the earth's crust, Major tectonic features of the oceanic and continental crust, Continental drift, mid oceanic ridges, deep sea trenches, continental shield areas and mountain chains. Paleomagnetism, seafloor spreading and plate tectonics, Island arcs, oceanic islands and volcanic arcs, isostasy, orogeny, geosynclines, and seismic belts of the earth, seismicity and plate movements, Geodynamics of the Indian plate.

**4. Palaeontology & Stratigraphy:** Micro-palaeontology, origin and evolution of life, classification and uses of micro fossils. Plant fossils: Gondwana flora and their significance, Invertebrate and vertebrate palaeontology, fossils and their morphology, distribution with geological time period.

Principles of Stratigraphy, geological time scale, modern methods of stratigraphic correlation, Precambrian Stratigraphy of India, Stratigraphy of the Palaeozoic, Mesozoic and Cenozoic formations of India. Gondwana system and Gondwana land, origin of Himalaya and evolution of Siwalik basin, Deccan traps, Quaternary Stratigraphy, rock record, paleoclimates and paleogeography.

**5. Igneous Petrology & Geochemistry:** Origin of magmas, phase equilibrium in igneous systems, Bowen's reaction principle, Magmatic evolution and differentiation, Structures and

textures of igneous rocks, Classification of igneous rocks, Magmatism and tectonics, Igneous rock suites- Ultramafic rocks, Basic rocks, Intermediate rocks, Acidic rocks and Alkaline rocks.

Geochemistry, Elements, Meteorites, Primary geochemical differentiation of earth, Goldschmidt's geochemical classification of elements, Periodic table, Magmatism as geochemical process, Major elemental distribution in igneous rocks, Trace element distribution in igneous rocks, Sedimentation as a geochemical process, Metamorphism as a geochemical process, Isotope geochemistry, Atmospheric geochemistry.

**6. Metamorphic Petrology & Thermodynamics:** Metamorphism, factors and kinds of metamorphism and metamorphic processes; Classification of metamorphic rocks and nomenclature, Structures and textures, zones, grades, and facies of metamorphism, Phase relations and phase diagrams for metamorphic mineral assemblages, processes and products of Contact, Regional, thermal, dynamo-thermal metamorphisms, metasomatism, granitization, typical Indian rocks.

Objectives of thermodynamics, inter-relationship between petrogenetic processes and thermodynamics, Role of thermodynamics in geochemistry, Phase rule, 'pressure-temperature-depth relations' among various metamorphic facies and ultra metamorphism, Paired metamorphic belts, Metapelitic and metabasic minerals and mineral assemblages, First law of thermodynamics, Second law of thermodynamics, P-T diagrams, geothermobarometry, pressure(P)-temperature(T)-time(t) paths.

**7. Sedimentology & Petroleum Geology:** Sedimentary environments- fluvial, glacial, eolin and lacustrine environments, transitional environments including deltaic, beach and tidal flats, marine environments including shelf (clastic and non-clastic) and deep sea sedimentary environment, Evolution of sedimentary basins, Tectonic setting of sedimentary basins.

Petroleum Geology, Constitution and Genesis of hydrocarbons, conversion of organic matter to petroleum, variety of petroleum hydrocarbons and gas hydrates, Reservoir rocks, Migration and accumulation of oil, structural traps, stratigraphic traps and combination traps, salt domes, methods of Exploration and exploitation of petroleum, Geographic and stratigraphic distribution of oil and gas, global distribution, petroliferous basins in India.

**8. Ore Genesis, Mineral Deposits and Mineral economics:** Modern concept of ore genesis, principal ore mineral groups, plate tectonics and ore deposits, ore textures, Paragenetic sequences and zoning in metallic ore deposits, ore microscopy, application of geothermobarometry, fluid inclusions in ores, Role and application of stable isotopes in ore genesis, Petrological ore associations with Indian examples, orthomagmatic ores of mafic-ultramafic association, diamonds in kimberlites, REE in carbonatites, chromite in chromitites and basic rocks, PGE in ultramafic and basic rocks, Chemical and clastic sedimentation, stratiform and stratabound ore deposits (Mn, Fe, non-ferrous ores), placer concentrations, Ores related to weathering and weathered surfaces, laterite, bauxite and manganese nodules.

Study of geology, nature of occurrence and the genesis of the following ore deposits with special reference to India- Iron, Chromite, Manganese, Copper, gold, Lead and Zinc, Bauxite, Magnesite, Barites, Mica, Asbestos, decorative stones, *Mineral based Industries:* Iron and steel; *Refractories:* Ceramic, electrical and insulators, glass.

Strategic, critical and essential minerals. India's status in mineral production. Change in pattern of mineral consumption, National Mineral Policy. Mineral concession rules, Marine mineral resources and law of sea, Conservation and substitution of minerals.

**9. Environmental Geology:** Concepts and principles, Natural hazards, preventive/precautionary measures-floods, landslides, earthquakes, rivers and coastal erosion. Impact assessment of anthropogenic activities such as urbanization, open-cast mining and quarrying, river-valley projects, disposal of industrial radioactive waste, excess withdrawal of groundwater, use of fertilizers, dumping of ores, mine waste and flyash, Organic and inorganic contamination of groundwater and their remedial measures, soil degradation and remedial method, Environmental protection-legislative measures in India, factors for groundwater subsidence.

**10. Engineering Geology** Mechanical properties of rocks and soils, Geological investigations for river-valley projects-dams and reservoirs, tunnels-types, methods and problems, Bridges-types and foundation problems, shoreline engineering, landslides- classification, causes, prevention and rehabilitation, Earthquake resistant structure, Problems of groundwater in engineering projects and Geotechnical case studies of major projects in India.

**11. Mineral Exploration and Fuels:** Methods of surface and subsurface exploration, prospecting for economic minerals and fuels-drilling, sampling, and assaying. Geophysical techniques – gravity, electrical, magnetic, air borne, and seismic surveys, Instrumental techniques of detection and measurement of radioactivity, Radioactive methods for prospecting and assaying of mineral deposits. Geomorphological and remote sensing techniques,

Geobotanical and geochemical methods. Bore hole logging and survey. Origin of coal, Stratigraphy of coal measures, Fundamentals of coal petrology, peat, lignite, bituminous and anthracite, Industrial application of coal, Indian coal deposits,

Origin, accumulation, migration and entrapment of natural hydrocarbons, characters of reservoir rocks, structural, stratigraphic and mixed traps, geographical and geological distribution of petroliferous basins of India. Gas hydrates and Coal Bed Methane occurrences, Mineralogy and geochemistry of radioactive minerals, distribution of radioactive minerals in India, Radioactive methods in petroleum exploration-well logging techniques, nuclear waste disposal-geological constraints.

**12. Hydrogeology:** Origin of water, Hydrological cycle, water table, Rock properties affecting groundwater, Types of aquifers, Porosity, permeability, specific yield and retention, hydraulic conductivity, transmissivity, storage and storage coefficient. Water level fluctuation and causative factors, methods of pumping tests and analyses, evaluation of aquifer parameters, artificial recharge of groundwater, groundwater legislation, groundwater quality and groundwater pollution, arsenic and fluoride problems, quality criteria for groundwater use, salt water intrusion in coastal aquifers and remedial methods, surface geophysical methods-seismic, gravity, geoelectrical and magnetic, subsurface geophysical methods-well logging for delineation of aquifers and estimation of water quality, Watershed management.

**13. Photo Geology, Remote Sensing, GIS and GPS:** Elementary idea about photogeology: electro-magnetic spectrum, types & geometry of aerial photographs; factors affecting aerial photography; Fundamentals of remote sensing; remote sensing systems; remote sensing sensors; signatures of rocks, minerals and soils. Application of remote sensing in geosciences and geomorphological studies, Types of Indian and Foreign Remote Sensing Satellites, Digital image processing; fundamental steps in image processing; elements of pattern recognition and image classification, Geographic Information System (GIS), components of GIS; product generation in GIS; tools for map analysis; integration of GIS with remote sensing. Geographic positioning system (GPS), scope of GPS, advantages and uses of GPS in different fields.

**14. Mining Geology:** Alluvial, open-pit and underground mining methods; mine organization and operation; mine hazards. Sampling techniques, drilling methods, estimation of ore reserves, Cost of mining; future costs and profits; life of mine; present value of mine. Environmental issues with mining.

## 12. LETTER PRESS (PRINTING TECHNOLOGY) (DEGREE LEVEL)

### Printing Processes, Paper & Ink Technology

All Printing Processes – Applications, Principles, Properties and Characteristics,

Paper – Raw materials used in Paper, Pulp Making, Materials used in Pulp Making, Manufacturing of Paper, Recycling of Paper, Physical Characters of Paper & Board, Properties of Paper, Instruments used to measure properties of paper and Boards, Paper testing Methods, Problems faced with paper

Ink – Ingredients, Manufacturing of Ink, Properties of Ink, Drying Mechanism, Inks used in Different Printing Processes and their Properties, Ink Problems

### Offset Process, Gravure Process & their Surface Preparation

Offset Printing Process & their Surface Preparation – Classification of Offset Printing, Sheet fed – Machine Structure and Types, Web Offset – Machine Structure and Types, Auxiliary equipment, Surface Preparation – Types of Planographic Plates, Surface chemistry of Plates, Plate making materials, Computer to plate technology, Problems and remedies.

Gravure Process – Applications of Gravure, Machine Structure and Types, Gravure Cells, Construction of Gravure Cylinder, Etching and Engraving techniques, Gravure cylinder surface finishing techniques, Slitting Operations, Materials used for Gravure Cylinder, Solvents used Problems and remedies.

### Flexography, Screen Printing & their Surface Preparation

Flexography – Aniline Printing, Flexography Machine Structure and Types, and Flexography Plates – Classification, Materials used, Making of Plates, Problems and remedies.

Screen Printing – Frames, Screen - Treatment, Materials used, Squeegee, Stencil Making and its Methods, Inks & Solvents used in Screen Printing, Drying, Printing Machinery Problems and remedies.

### Pre-Press Technology

Basic of Computers, Desk Top Publishing, Electronic Image, File Formats, Printers Design, Colour Science, Colour Separation, Colour Measuring Instruments, Typography, Print Planning, Colour Management

### Print Finishing, Packaging & Converting

Print Finishing – Book Binding & its Classification, End Papers, Warehouse, Covering Materials, Securing Materials, Reinforcing Materials, Adhesives, Different Finishing Operations, Different Equipment's used and Automation in Post-Press.

Packaging & Converting – Functions, Criteria, Types, Role of Designing in Packaging, Carton Making, Manufacturing of Corrugated Boxes, Rigid Boxes, and other Materials used for Packaging, Different Converting Processes, Bar Coding

### **Specialty Printing Technologies, Advertising & Quality Control**

Specialty Printing Technologies – Non-Impact Printing Technologies and their Mechanism, E Print – E Books, E Paper & Inks, Security Printing Processes, Types of Security Paper & Inks & its Manufacturing, E-Publishing

Advertising – Different Medias, Types of Print Media, Advertisement creation and Promotion, Advertising Ethics, Legal Issues, Copy rights, Elements of Marketing, Channel distribution

Quality Control – Objectives, Functions, Benefits, Quality control as Management tool, Quality control in all areas of Printing, Print Quality checking devices, Standards and their tolerances, Different ISO's.

## **13. MECHANICAL ENGINEERING (DEGREE LEVEL)**

### **Section I: Applied Mechanics and Design**

**Engineering Mechanics:** Free-body diagrams and equilibrium; Friction, rolling friction, belt – pulley, screw jack, wedge, Trusses and Frames; Virtual work; Kinematics and Dynamics of Particles and Rigid Bodies in Plane Motion; Impulse and Momentum (Linear and Angular) and Energy Formulations; Impact.

**Strength of Materials:** Stress and Strain, Stress-Strain Relationship and Elastic Constants, Poisson's Ratio; Mohr's Circle For Plane Stress and Plane Strain; Thin Cylinders; Shear Force and Bending Moment Diagrams; Bending And Shear Stresses; Deflection Of Beams; Torsion Of Circular Shafts; Euler's Theory Of Columns; Energy Methods; Thermal Stresses; Testing Of Materials with Universal Testing Machine (UTM); Hardness And Impact Strength.

**Theory of Machines:** Displacement, Velocity and Acceleration Analysis of Plane Mechanisms; Dynamic Analysis of Slider-Crank Mechanism; Gears and Gear Trains; Flywheels, Gyroscope and Governors; Balancing of Reciprocating and Rotating Masses.

**Vibrations:** Free and Forced Vibration of Single Degree of Freedom Systems, Effect of Damping; Vibration Isolation; Resonance; Critical Speeds of Shafts.

**Machine Design:** Design For Static and Dynamic Loading; Failure Theories; Fatigue Strength; S-N Diagram; Design of Machine Elements such as Bolted, Riveted and Welded Joints, Shafts, Spur Gears, Rolling and Sliding Contact Bearings, Springs, Brakes and Clutches.

### **Section II: Fluid Mechanics and Thermal Sciences**

**Fluid Mechanics:** Fluid Properties; Fluid Statics, Manometry, Buoyancy, Forces on Submerged Bodies, Stability of Floating Bodies; Fluid Acceleration; Differential Equations of Continuity and Momentum; Bernoulli's Equation; Viscous Flow of Incompressible Fluids, Boundary Layer, Elementary Turbulent Flow, Flow Through Pipes, Head Losses in Pipes and Bends.

**Heat-Transfer:** Modes of Heat Transfer; One Dimensional Heat Conduction, Resistance Concept, Electrical Analogy, Fins; Unsteady Heat Conduction, Dimensionless Parameters in Free and Forced Convective Heat Transfer, Various Correlations for Heat Transfer in Flow Over Flat Plates and Through Pipes, Effect of Turbulence; Radiative Heat Transfer, Black And Grey Surfaces, Shape Factors, Network Analysis, Heat Exchanger Performance, LMTD and NTU Methods.

**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; thermodynamics property, availability and irreversibility; thermodynamic relations.

**Power Engineering:** Air compressors-Reciprocating and rotary compressors; Rankine, Brayton Cycles with Regeneration, Inter cooling and Reheat.

**I.C. Engines:** Air-standard Otto & Diesel Cycles, Combustion in S.I. & C.I. Engines, Performance & Testing of internal combustion engines.

**Refrigeration and Air-Conditioning:** Vapour Refrigeration Cycle, Heat Pumps, Gas Refrigeration; Reverse Brayton Cycle; Moist Air: Psychrometric Chart, Basic Psychrometric Processes.

**Turbomachinery:** Pelton Wheel, Francis and Kaplan Turbines, Impulse and Reaction Principles, Velocity Diagrams.

### **Section III: Materials, Manufacturing and Industrial Engineering**

**Engineering Materials:** Structure and Properties of Engineering Materials, Heat Treatment, Stress-Strain Diagrams for Engineering Materials, Iron-carbon diagram.

**Metal Casting:** Design of Patterns, Moulds and Cores; Solidification and Cooling; Riser and Gating Design.

**Metal Forming:** Plastic Deformation and Yield Criteria; Fundamentals of Hot and Cold Working Processes; Load Estimation for Bulk (Forging, Rolling, Extrusion, Drawing) and Sheet (Shearing, Deep Drawing, Bending) Metal Forming Processes; Principles of Powder Metallurgy.

**Joining Processes:** Principles (Gas, Arc, Resistance and Solid State) of Welding, Brazing, Soldering; Adhesive Bonding.

**Machining and Machine Tool Operations:** Mechanics of Machining; Basic Machine Tools; Single and Multi-Point Cutting Tools, Tool Geometry and Materials, Tool Life and Tool Wear; Economics of Machining; Principles of Non-Traditional Machining Processes; Principles of Work Holding Devices, Principles of Jigs and Fixtures.

**Metrology and Inspection:** Limits, Fits and Tolerances; Linear and Angular Measurements; Comparators; Gauge; Interferometry; Form and Surface Finish Measurement; Alignment and Testing Methods; Tolerance Analysis in Manufacturing and Assembly.

**Computer Integrated Manufacturing:** Basic concepts of CAD/CAM and their integration tools.

**Production Planning and Control:** Forecasting Models, Aggregate Production Planning, Scheduling, Materials Requirement Planning.

**Inventory Control:** Deterministic Models; Safety Stock Inventory Control Systems.

**Operations Research:** Linear Programming, Simplex Method Transportation, Assignment, Simple Queuing Models, PERT and CPM.

#### 14. METALLURGICAL ENGINEERING (DEGREE LEVEL)

##### **MINERAL PROCESSING AND PRINCIPLES OF EXTRACTIVE METALLURGY:**

Ore Dressing, Sampling of ores, Comminution: sizing, Concentration operations, Classification, Jigging, Flotation; Basics of Pyrometallurgy, Hydrometallurgy and Electrometallurgy.

##### **PHYSICAL METALLURGY AND HEAT TREATMENT:**

Phase diagrams, Crystal structures, Solidification of metals, Iron carbon diagram, Metallography, Heat treatment process, CCT diagrams, hardenability; Superalloys, shape memory alloys – classification, heat treatment, properties and applications.

##### **METALLURGICAL THERMODYNAMICS:**

Thermodynamics: concepts of system, First Law of Thermodynamics, Kirchhoff's equation; Second Law and third law of Thermodynamics, Enthalpy and entropy, Boltzmann equation. Energy Functions: Helmholtz and Gibbs energy change;. Application of the Clausius – Clapeyron equation; Solutions: Composition, Concept of chemical potential, partial molal quantities, Gibbs - Duhem equation; Application of Ellingham diagrams to process metallurgy.

##### **MECHANICAL METALLURGY:**

Plastic Deformation in Metals and Alloys: concept of dislocation; slip and twinning, theories of fracture, Griffith's theory of brittle fracture, ductile fracture; Hardness tests; Tension Test, stress-strain curves, DBTT curve, Fatigue Test, Creep and Stress Rupture.

##### **IRON & STEEL MAKING:**

Principles of Iron making, Preparation of iron ores; Iron making through blast furnace, Physical chemistry of Iron making, Control of C, Si, S, P in pig iron. Blast furnace Slags and its properties; Blast furnace operations and difficulties, modern trends in blast furnace; steel making: Principles and types of deoxidation, fundamentals of direct reduction, applications of DRI. Coal based DR processes; Smelting Reduction Processes.

##### **NON FERROUS EXTRACTIVE METALLURGY:**

Copper: Matte smelting, converting; Fire refining; Electrolytic refining; Hydro- Metallurgical copper extraction; Zinc production in retort process and Blast furnace; Lead: Blast furnace smelting, Refining of lead bullion. Aluminium: Bayer process, Hall - Heroult process, Anode effect; Magnesium: Production of a hydrous Magnesium chloride from seawater, Pidgeon and Handspring processes; Titanium: Upgrading of ilmenite, chlorination of titanium, Kroll's process; Uranium: Acid and alkali processes for digestion of uranium ores, Purification of crude salt, Production of reactor grade UO<sub>2</sub> and uranium.

##### **MECHANICAL WORKING OF METALS:**

Stress and Strain Relationship for Elastic Behavior: State of stress in two dimensions. Mohr's circle of stress in two dimensions, Elements of Theory of Plasticity; Fundamentals of Metal Working: Classification of forming processes; forging: Classification, Forging defects, Rolling of Metals and Extrusion.

**POWDER METALLURGY OF METALS:**

Importance of powder metallurgy, Characterization of Powders: Compaction, Sintering. Mechanisms of solid state and liquid phase sintering; Testing and quality control, metallic and ceramic P/M components; Applications of P/M products.

**NON - METALLIC MATERIALS:**

Definition and classification of nonmetallic materials, Ceramics: Introduction, classification, structure, and applications of ceramics; Glasses: Classification and applications; Composites: Manufacturing of Polymer matrix, metal matrix, and ceramic matrix composites.

**MATERIAL PROCESSING (CASTING & WELDING):**

Types of Foundries, Patterns and allowances, Moulding materials, Moulding Processes, Casting Methods, Melting and Solidification, casting defects ; welding processes: Gas Welding, Arc Welding processes, MMAW, GTAW, MIG, SAW and Resistance Welding, Metal Joining Techniques, Weldability, Microstructure of welds.

**FURNACE TECHNOLOGY & PYROMETRY:**

Steady State Heat Transfer;Furnaces Characteristic features of vertical shaft furnaces, reverberatory furnaces, Electric Arc and Induction furnaces. Pyrometry.

**NON DESTRUCTIVE TESTING:**

Visual methods; Penetrant flaw detection, Magnetic particle testing, Eddy current testing, ultrasonic testing and Radiographic testing methods.

**SUPER ALLOYS:**

Classification and selection of superalloys, Relationship of properties to Microstructure in superalloys; Melting of Superalloys; Principles and practices of vacuum Induction Melting and Vacuum Arc melting Forming Methods.

**15. PACKAGING TECHNOLOGY (DEGREE LEVEL)****Packaging basics**

History and concept of packaging, Ancient Modern History of food packaging – packaging evolution – super market- its Chronological developments , its need and role in society, Physical and Physio-chemical characteristics of a product, functions of packaging, components, various types of hazards, packaging laws and regulations ,corrosion prevention in packaging including preventive coating methods.

Product compatibility –Permeability, definition of migration and types of migrations, laws on diffusion, Ficks Law and Barriers law. Plasticizers, their types, functions and applications, Shelf life, its controlling factors, testing procedures and devices.

**Packaging materials**

Properties , types , conversion processes, applications and quality control of primary packaging materials such as paper, paper board, CFB, plastics and plastic films, elastomers glass, metals, composite containers, laminations, wood and ancillary materials like adhesives, cushioning, labels, labeling including marking & bar codes seals, closures & dispensing devices, cylindrical and rectangular shipping packages, flexible shipping packages, pallets & unit loads.

**Testing of packaging materials**

Surface, physical, chemical, printability tests, compatibility and shelf life studies, testing methods including identification of plastics, performance testing methods for evaluation of transport packages, mechanical tests - drop test- vibration test - compression test - impact test - rolling test, climate test: rain test - sound and dust tests - salt spray test - fungus resistance tests.

**Packaging of pharmaceuticals**

Concept of drug, general aspects of drug package, basic terminology, FDA , ampoule, vial, caplet , capsule, DMF, parenteral drug, USP, BP, CRP ,classification of pharmaceuticals , preparation of various pharmaceutical products, spoilage mechanisms, various hazards, national and international regulators and pharmacopoeias, labels, leaflets, barcodes ,track and trace and anti-counterfeit methods, materials used for pharmaceutical packaging- glass, metals, plastics, plastic films, elastomers ,paper and paper board-their properties advantages and various applications, fabrication and filling of various containers, container filling and

sterilization processes. Closure by adhesives, closure by separate devices, cans, bottles, jars, tubes, closure materials for pharmaceutical products, child resistant packaging, testing procedure, various primary and secondary packages used for pharmaceuticals including medical administrative devices, concept of QbD in package development.

### **Product packaging**

Packaging of dairy, fresh, frozen and irradiated foods, confectionery, beverages, horticultural crops, engineering goods, electronic goods, soaps and detergents, desired attributes of soaps & detergents, fertilizers, pesticides, chemicals, textiles and handicrafts, cosmetics and personal care, aerosols, dangerous goods, major factors governing the selection of packaging materials & packages, economics, transport, storage and legal obligations.

### **Packaging design**

Objectives of package design, functions and conditions, safety factors, impact design criterion, horizontal impact, vertical cushioning displacement, design cushioning theory, application of force deformation curves, load curves, cushioning factors and reliability, economics of optimum cushioning - Use of tension spring mounting systems, Full suspension package, non-linear energy absorption load factors for vertical drops, design considerations, Use of rubber shear mounts -physical concept of flexible mounting systems, natural frequency, - Materials, specifications, plywood containers, typical plywood container analysis, handling loads, stacking loads - Bottle design, special requirement for bottle performance, manufacturing and filling, specification. Environmental concerns - Glass container design - Container shape and dimensions - Marketing and sales factors. Color, shape, labels, decoration, surface conditions. Scope of packaging field, role of shipping container - clear & legible communication, legal aspects of packaging graphics – designers approach to clear & legible communications. Packaged product information – government & consumer issues.

### **Package printing**

Type Production & Camera Work, Letter Press - Offset Lithographic Printing, Reprography, Rotogravure and Screen Printing, Flexo Graphic, Digital Printing and Proofing Methods

Process color work – electronic color separation, packaging graphics marketing communication roles –topography and copy, color, design forms, UPC symbolic and other penal copy. Evolution - basics, printing inks - ink controls - presses - applications - advantages and disadvantages - color laser-ink jet prints, proofing methods. Principles of electronic, computer and laser operated devices used in printing and modern developments.

### **Packaging processes and machines**

Various methods of filling and sealing of liquid, semi liquid and dry products – bottling, canning & machineries involved, wrapping and bundeling, bags manufacture, filling and closing, types of bags, BIB packages, system packaging, selection of appropriate system, salient features of different types of systems, lined carton system, coated and laminated carton system, stand up pouches, aseptic filling and packaging systems. Vacuum packaging, gas packaging, strip, skin and blister packaging machines-blow & injection moulding machines, metallization, thermo forming, and form fill and seal machines

**Packaging management and economics:** Introduction, importance of economy in production role of packaging in national economy. Packaging in general economy, total packaging cost, transport cost, functional or protective packaging, effect of improvement in packaging design, substitute of resources, recycling resources - Uses of different packaging materials, packaging material cost. Relation of packaging cost and percentage lost in packaging materials - Computation of cost for different packages like CFB aluminum cans, containers etc., Bottles, Closures, Rigid Carton, Folding Carton etc.

### **Eco-friendly and export packaging**

Importance of Eco-friendly package, Bio-Degradable Materials, Recycling of Packaging materials, 3R concept-Reduce, Reuse, Recyclable packages. Environmental aspects of packaging materials, Degradable materials for packages - Concept of solid waste. Disposal options-Green Packaging and its principles- Benefits of Eco-friendly packaging - Concept and idea of export packaging - Packaging Symbols -Considerations for export packaging - Cargo transportation, Packaging containerized cargo - Shipping documents, shipping marks - Inspection of export packaging and markings.

## 16. PHARMACY (DEGREE LEVEL)

- i. History of Pharmacy: Code of ethics in Pharmacy, Posology; Principles of dispensing of mixtures, emulsions, powders and suppositories; Different types of Incompatibilities.
- ii. Pharmacy Act; Drugs and Cosmetics Act and Rules; Drugs price control order including amendments.
- iii. Methods of Sterilization and test for sterility; Preparation of vaccines, Sera and Anti-toxins; Manufacture of Penicillin and Streptomycin.
- iv. Methods of classification of crude drugs; Adulteration and evaluation of crude drugs.
- v. **Introduction to secondary metabolites: Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins**
- vi. Pharmacognosy of Senna, Digitalis, Ispaghula, Cinchona, Cinnamon, Rauwolfia, Podophyllum, Ergot, Cod liver oil and Gelatin.
- vii. Principles, instrumentation and applications of Colorimetry, Spectrophotometry, fluorimetry, gas chromatography and High performance liquid chromatography.
- viii. **Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and aminoacids.**  
**Principles and applications of bioassay; Types of bioassay; Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT**
- ix. Theory and applications of rheology (Newtonian and Non-Newtonian); Colloidal and interfacial phenomenon and their applications; Coarse dispersion (emulsions and suspensions)
- x. Physico-Chemical, formulation and biological factors effecting drug absorption.  
**Drug discovery and clinical evaluation of new drugs- Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmaco vigilance**
- xi. **Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances. BCS classification of drugs & its significance; Application of preformulation; considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms**  
Formulation, technology and quality control of tablets, capsules, liquid orals, aerosols, creams and ointments, injectables and sustained release medicaments.
- xii. **Drug stability: Reaction kinetics; Physical and chemical factors influencing the chemical degradation of pharmaceutical product, specific & general acid base catalysis, Stabilization of medicinal agents against common reactions, Accelerated stability testing, Photolytic degradation and its prevention**
- xiii. **Radiopharmaceuticals: Radioactivity, Measurement of radioactivity, Properties of  $\alpha$ ,  $\beta$ ,  $\lambda$  radiations, Half life, radioisotopes and study of radio isotopes-Sodium iodide<sup>131</sup>, Storage conditions, precautions & pharmaceutical application of radioactive substances.**
- xiv. Structure activity relationship, synthesis, chemical nomenclature and uses of following classes of drugs – Hypnotics and Sedatives; Tranquilizers; Analgesics and Antipyretics; Anti-inflammatory drugs; Diuretics; Anti-hypertensives and Chemotherapeutic Agents.
- xv. Pharmacology of Local anaesthetics; Diuretics; Hormones; Hypoglycemic agents; Anti-histaminics; Drugs acting on central nervous system; Adrenergic and Cholinergic drugs and Cardio-vascular agents.
- xvi. Pharmacokinetic and Pharmacodynamic drug interactions with suitable examples; Teratogenicity; Drug-induced diseases.  
**Pathophysiology of Diabetes, epilepsy, rheumatoid arthritis, leprosy, cancer, asthma, atherosclerosis.**

## 17. PHYSICS (POST GRADUATE LEVEL)

### 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. Magnetostatics: 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. Charged 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. Stern-Gerlach experiment. Time independent perturbation theory and applications. Variational method. Time dependent perturbation theory and Fermi's golden rule. Selection rules. Identical particles. 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.

### 18. TANNERY ENGINEERING (LEATHER TECHNOLOGY) (DEGREE LEVEL)

#### A. Skin Proteins and Pre-tannages

1. Chemical constituents of hides and skins – Fibrous and Non – fibrous proteins structure and Chemical Features. Reactive groups of Collagen and cross linking. Histological Characteristics of hides and skins.
2. Preservation techniques – Principles involved – short term preservation – Defect in hides and skins.
3. Chemistry and Principle of different pretanning processes like soaking, liming, deliming, bating and pickling. Different methods of pretanning processes as applied to light, heavy and industrial leathers.

#### B. Theory of tannages

1. Types of vegetable tanning materials – Classification, and chemistry of vegetable tanning. Mechanism of vegetable tanning. Synthetic tannins classification General methods of manufacture and application in leather processing. Chemistry and mechanism of oil and aldehyde tannages.
2. The Chemistry of Chromium salts. Preparation of Chrome tanning salts. Mechanism of Chrome tanning.
3. Chemistry and mechanism of Aluminium, Zirconium, titanium, silicate and Phosphate tannages.
4. Chemistry and mechanism of combination tannages involving vegetables tanning materials, aldehydes and other mineral tanning agents.

#### C. Leather auxiliaries and post tanning Operations

- 1) Chemistry of neutralization and bleaching processes.
- 2) Classification of dyes and blending of dyes. Chemistry of dyeing auxiliaries. Theory and mechanism of dyeing.
- 3) Principles and methods of sulfation, sulfonation and sulfitation of oils. Preparation of synthetic flat liquors. Chemistry and mechanism of fatliquoring.
- 4) Classification of retanning agents and their application.
- 5) Chemistry and methods of preparation of aqueous pigment pastes, lacquers lacquer emulsion, synthetic and protein binders and impregnating agents. Patent leather finishes.

#### D. Practice of Leather Manufacture – I

- 1) Principles and practices involved in the manufacture of following types of leathers:- E.I. tanning of kips, buffcalf, cowcalf and Goat and Sheep skins. – Vegetable tanned sole leather, Chrome sole leather. Sole leather with improved properties. – Picking band leathers and pickers. – Digressing of E.I. Leathers into different finished leathers such as semichrome glazed kid, lining leathers, ----- leathers and diaphragm leathers. – Kattai and Bunwar leathers. – Specialty leathers for mountaineering shoes, high altitude shoes and pilot gloves.
- 2) Role of Machinery in Leather Processing.

#### A. Practice of Leather Manufacture – II

- 1) Processes and principles involved in manufacture of following types of leather processing of Wetblue leathers – Full Chrome Upper leathers – Upholstry leather Lining leathers – Harness, belting and Saddlery leathers. – Football, Hockey ball, Cricket ball and other sports goods leathers – Chamois leather Fashion garment Leathers – Utility glove leathers.

2) Principle methods and mechanism of drying of leathers.

#### B. Material Testing & Quality Control

- 1) Principles of analytical methods employed of water, chemical agents used in soaking, liming, deliming, bating, pickling. Analysis of liquors of beam house process, vegetable tanning extracts, spent tanliquors, chrome extracts – zirconium and aluminum tanning salts. Formaldehyde oils and fats – Fatiliquor and other auxiliaries. Estimation of Epsom salt and glucose.
- 2) Instrumental methods of analysis using potentiometry, spectrophotometry chromatography, ion exchange resins, calorimetry.
- 3) Analysis of vegetable and mineral tanned leathers- Determination of PCP at azo dyes, (Aryl amine based) in leather.
- 4) Principles and methods employed in physical testing of leathers.
- 5) Standards and quality control.

#### C. Leather Product Technology

- 1) Footwear: - (a) Anatomy of human feet, foot comfort, foot care and their relationship to footwear. Foot and last measurements Shoe sizing and fitting.  
(b) Materials used of footwear – Leather and non-leather materials for upper, -- and components.  
(c) Shoe design and pattern making  
(d) Grading clicking and closing – skiving – stitching – lasting, sole attachment – bending and edge treatments.  
(e) Construction of cemented and welted shoes machines used.
- 2) Leather goods and garments:- Classification – selection of materials – modern methods of construction and machinery – Hand tools and grinders, zips, linings and fittings – standardization quality control and inventory control.

#### D. Organisation and Management of Leather manufacture

1. Livestock population of Telangana – availability of hides and skins – marketing of hides/skins
2. Location, lay-out and selection of machinery for tanneries manufacturing different types of leathers – estimates of investment, costing and feasibility.
3. Employment generation – training and training institutes-Telangana state Leather industry Promotion Corporation(TSLIPC),Leather Parks in Telangana- labour laws for tannery occupational health and safety.
4. Export performance of Finished Leather, Leather Products – marketing strategies and development – Features of overseas sales contract – Role of financial institution.
5. Type of tannery effluents- characteristic – Different methods of effluent disposal primary and secondary systems – standards and specifications of various type of disposal – soil waste disposal.
6. Total quality management (TQM) – Basic concepts – Principles of TQM – Barriers to TQM implementation TQM – Principles – Customer Classifications – Perception of Quality – TQM Tools – Quality Systems. Need for ISO 9000, Quality Auditing, ISO 14000 concept – Requirements and benefits.Industry4.0, Leather4.0 Industry4.0 to 5.0 & Industry 5.0.

## 19. TEXTILE TECHNOLOGY (DEGREE LEVEL)

### I. TEXTILE FIBRES

Basic terms in textiles - classification of textile Fibres –General features natural fibresfibres – Important varieties and stages in cultivation of natural fibres- Cotton, Wool and Silk. -Physical, microscopic and chemical structure of natural fibres - manufacturing of semi synthetic fibresand Synthetic fibres – raw materials and monomers used for producing synthetic polymers – requirements of fibre forming polymers - methods and techniques of Polymerisation – production processes of synthetic polymers viz. Polyester, Nylon6, Nylon6,6, Acrylic, Modacrylic – production process of staple fibres and filament yarns from the polymers- methods of texturization – identifying features, various properties and applications of textile fibres.Manufacture, properties and applications of Rubber, Spandex, Aramid fibres,Glass fibres, Carbon fibres, Metallic fibres, Vinyon, Flouro carbon and Micro fibres.

### II. SPINNING

Methods of Ginning – different methods of yarn manufacture-influence of raw material characteristics on spinning-Blow room - principles of opening, cleaning and mixing - different machines used in blow room and their working principles – transport and control of material flow- Carding - Objectives and principle of carding-various parts of carding machine and their

functions – theory of carding action - card clothing –stop motions and auto levelling on a card-maintenance of card –card setting points–causes and remedies for carding defects and variations in sliver count – Draw frame – Objects, functions and principle of drafting - types of drafting systems – types of top roller weighting systems- drafts – break draft, main draft and total draft- Roller settings and draft distribution – Combing – preparatory processes for combing - objects and principle of combing –advantages of combing - cyclic operations of combing – factors influencing combing - noil % - Simplex - objects and basic operations on a simplex machine -parts of Simplex machine and their functions – draft on simplex - principle of twist insertion - winding mechanism - builder motion – doffing – process and product defects and remedies – Ring frame- objects and functions of Ring frame – parts and functions of ring frame – ring and traveler types and profiles – drafting arrangement and yarn guiding devices - principle of twisting and twist levels – twist and twist multiplier- structure of ring package-cop building process- ancillary equipment on ring frame-ring frame process defects and remedies – causes of yarn breakages- yarn quality and waste control- Non conventional spinning methods –open end spinning –principle of yarn formation, parts and functions of rotor spinning- principles of friction spinning – false twist spinning – air jet spinning – characteristics of yarns produced by different methods – Cone winding – parts and functions of the machine -winding parameters – post spinning processes-machines used, basic principles of doubling, reeling, singeing and conditioning - sewing thread. Classification of fancy yarns- methods of producing fancy yarns - requirements and manufacture of sewing threads -Sewing thread packages and their applications - essential properties of sewing threads.

### III. WEAVING

Sequence of weaving preparatory processes – beam warping and sectional warping – pirn winding-Sizing -Importance and objects of sizing – sizing ingredients and their functions – size preparation- process parameters in size box - main parts and working of slasher sizing machine –devices and mechanisms and modern controls on slasher sizing machine – drawing in and denting in operations -basic principle of weaving - types of looms –mechanisms of a loom – shedding, picking,beat up,let off and take up–auxiliary motions on a loom – power loom accessories – loom faults - fabric defects –Automatic loom and its features, advantages, essential attachments - weft feeler mechanisms -pirn changing mechanism - bobbin loader - automatic loom winder - multiple box looms- working cycle of drop box motion-pattern chain preparation for drop box motion

**Dobby shedding** -Limitations of tappet shedding-Comparison of doobby shedding with Tappet shedding-Classification doobbies - Single lift and double lift doobby-Positive and Negative Dobby-working of Double lift double jack Dobby -Right hand and Left hand doobby-Position of feelers-Heald reversing motion–pegging plan for doobby – mechanisms of paper pattern cam doobby, Rotary doobby, Climax cross border doobby and electronic doobby - Pick finding devices for doobbies- doobby mountings.

**Jacquard Shedding** : types of shed formations-functional parts of Jacquard- Single lift Single cylinder Jacquard-Double lift, Single cylinder Jacquard- Double lift, Double cylinder Jacquard-parts of Jacquard harness system and their functions - Systems of Harness mounting- types of Jacquard harness Ties - Sketching the design on point paper-importance of first hook of the Jacquard- Casting out principle- steps to card cutting-preparation of pattern card on piano card cutting machine-Jacquard card lacing- methods of increasing the figuring capacity of a Jacquard-working principle of Electronic Jacquard.

**Shuttle-less weaving:** Yarn quality requirements for shuttle-less looms- Weft accumulator – classification of shuttleless looms, their featuresand fields of application- types of selvages– characteristics of fabrics woven on different shuttle less looms –method of weft insertion on Sulzer projectile loom and Rapier loom - types of rapier looms - Dewas system and Gabler system -characteristics features,essential requirements of Air Jet loom- Maxbo Murata Air Jet loom -Traverse aids for maintaining air flow- weft insertionon water jet loom -types and working principlesmulti-phase weaving machines-Circular weaving -Terry loom –formation of pile by Terry motion -loom particulars for weaving terry cloth -principle of producing cut pile fabrics - characteristics of yarns used for terry fabrics-representation of basic terry pile structure -working principle and applications of narrow loom-working principle and applications of Tri axial loom.

### IV. WOVEN FABRIC DESIGN

Elements of woven fabric design - method of weave representation- procedure of drawing design and constructing draft, denting plan and lifting plan- types of drafts - reed selection in weaving- Classification of weaves -methods of ornamenting fabric.Plain weave and its Derivatives -Design, draft and lifting plan of plain weave-characteristics of plain weave-ornamenting plain weave - classification of plain cloths - Rib weave and Matt weave designs, draft plan, lifting plan, characteristics and applications- particulars, characteristics and end uses

of standard plainwoven fabrics, approximately square plain cloth, warp faced plain cloth, Weft faced plain cloth, Voile fabrics - Twill Weaves - twill weaves- classification- design, draft and lifting plan, characteristics and use products of various classified twill weaves -angle of twill and direction of twill.-factors that determine the prominence of twill weaves- designs of modified twill weaves - twist and twill interaction on appearance of fabric- Compound Weaves-sateen and satin weaves- design, characteristics, quality particulars and end use products of the weaves - Honey comb -Brighton honey comb -Huck – a- back, Mock leno - crepe weaves -methods of producing crepe surface-development of distorted thread effects- Classification, design, Standard quality particulars, end uses, weaving arrangement and loom equipment needed for Bedford cords, Welts and Piques -Principles of colour and weave effects- Extra Threaded, Backed and Double Cloths-methods of increasing weight of fabric -principle and different methods of producing, loom equipment needed for extra thread fabrics -different methods of disposing surplus extra threads -Backed fabrics –steps in construction of backed fabrics - Classification, principles of production and applications of double cloths.

## V. CHEMICAL PROCESSING OF TEXTILES

**Preparatory for wet processing:** Requirements of water for chemical processing of textiles- hard water and soft water - temporary hardness and Permanent hardness - Zeolite process of removing water hardness - mechanism of wetting textile material-functions of soaps and detergents in wet processing- anionic, cationic and nonionic surface active agents-sequence of chemical preparatory treatments for the textiles made by different types of fibres- wet processing of yarns, woven fabrics and knitted fabrics- commonly used chemicals in wet processing of textiles- effect of PH in Chemical processing of textiles -sequestering agents - different methods of singeing, desizing, scouring, bleaching and Mercerising – mercerisation of woven and knitted fabric- evaluation of the chemical preparatory processes.

**Dyeing:**General characteristics and essential properties of dye stuffs-Classification of dyes- applicability of various dyes on different fibres and characteristics of respective dyeing--natural dyes and synthetic dyes – types of dyeing based on form of textiles-functional groups in textile fibres responsible for dyeing- forces responsible for dye fixation - dye bath interactions - role of additives in dyeing - general mechanism of dyeing- batch dyeing-continuous dyeing-general terms used in dyeing - fibre dyeing- yarn dyeing-fabric dyeing and product dyeing- colour fastness ratings – methods and stages in application of water soluble dyes, water insoluble dyes and ingrain dyes- dyeing machinery used for fibres , yarn , fabric and garment and their working principles – methods of water extraction and drying the dyed textiles -preparation and dyeing of bast fibres -wool, silk and semi synthetics viz., Viscose and Acetate textiles – preparation and dyeing of synthetic textiles viz- polyester, Nylon, acrylic textiles with various dyes– mass colouration of textiles – dyeing of blends - dyeing of woven garments, knitted garments - dyeing of cotton garments, woollen garments, Polyester garments -fastness properties - dyeing faults.

**Printing and finishing of textiles:** essential ingredients used in print paste– different methods of printing – different styles of printing –after treatments for printed goods -identifying features of various methods of printing- finishing of textiles -classification of finishing treatments - principles of drying – calendaring - permanent setting of wool - heat setting of synthetics – Sanforising, anti-crease finish, wash and wear resistant finish, durable press ,water repellence and water proofing , Softening and stiffening, Soil release and stain release finish, Parchmentizing, Flame proofing-process sequence of garment finishing.

## VI. APPAREL PRODUCTION

**Sample development :**Basic definitions related to Apparel manufacture- Pattern Making and developments of Garment Sample-fabric properties to be considered for making garments - Importance of Measurements - pattern making –paper pattern - stages for pattern making- allowances for pattern making -Methods of pattern grading – manual and computer aided methods of garment pattern making - garment pattern construction -types of samples and their uses - proto sample development - sequence of garment sampling stages.

**Marker making and spreading –** methods of marker making –Marker efficiency- marker planning –requirements, quality control in marker planning - requirements, procedures and methods of fabric spreading- Automatic programmable spreading machine- quality factors and common problems in spreading-fabric cutting - process sequence, requirements, types of cutting machines - advantages and disadvantages of each- common defects in fabric cutting.

**Sewing:**Stitching machines required for garment industry - lock stitch formation - reasons for thread break, needle break and skip stitch - safety rules for garment sewing machine operator-types of garment stitches - types of stitches for knit fabrics - types of sewing machines - seam - types of seams and their uses - Seam defects and seam quality defects - causes of seam puckering.

**Garment accessories, Packing and Finishing:** Classification of garment accessories - garment closures - types and functions of interlining-requirements of fusing process - methods of resin coating for fusible interlining - features, scope and working principle of continuous fusing machine-, support materials – stays, lining, interfacing, shoulder pad- Pressing-principles, methods and components of pressing - principle of pleating -information contained in labels - types of labels -meaning of international care labelling codes - packing accessories and their functions. Decorative garment accessories - Features, types and uses of Lace fabrics - types of stays -classification and functions of different trimmings -types and manufacturing process of Ribbon - Bias tape - process of direct –to- Garment printing -garment decoration techniques – Appliques, Bias trimming, Ruffles , Smocking and Faggoting.

**Apparel Merchandising:** Flow chart of merchandising-activities-qualities and skills of merchandiser -key players in the apparel industry -sourcing of Raw material -types of merchandisers in apparel industry -various items required for production file -Buyer inspection - tracking system for effective merchandising -basic terms of Fashion terminology -Fashion cycle in Garment industry-functions of fashion Merchandiser -steps in marketing of fashion design - qualities of successful fashion designer -variations in fashion adoption -consumer identification with fashion cycles -tasks of Retail Merchandiser -objectives of Visual Merchandising-functions of Visual Merchandiser- essential tools used for Visual Merchandising

## VII. TEXTILE TESTING

Sampling methods for fibres, yarns and fabrics- Routine tests conducted in textile mills and the method and instrument used for each –Influence of moisture and measurement of moisture – standard regain of textile fibres- Conditioning of samples for testing- Measurement of fibre parameters- different methods and instruments used for measuring fibre length, fineness, maturity and fibre neps on conventional and advanced instruments –Measurement of yarn count, yarn twist, yarn hairiness, yarn evenness, yarn faults - instruments used and principles of testing- Stress – strain curves of textile fibres - different principles of tensile testing - measurement of fibre strength, yarn strength and fabric strength – instruments used, principles of testing and methods - measurement of fabric constructional particulars, dimensions and properties- Testing of fabric handle, stiffness Drape -fabric comfort properties - air permeability water repellence, thermal insulation, thermal conductivity and flammability of the fabric –testing of serviceability properties - Identifying the type of fibre in the fabric -evaluation of soil and stain removal-evaluation of fabric stretch properties-methods for testing knitted fabrics- testing of courses and wales per unit length-spirality intended for form-fitting apparel-causes of shrinkage and dimensional changes in garment-principle of evaluating dimensional changes in the fabric - durable press evaluation of the fabrics and apparels-testing of dyed fabric properties - fastness to light, washing, dry cleaning, hot pressing, chlorination, crocking, perspiration, testing for class of dye in the dyed fabric-factors influencing strength properties of apparel -factors influencing seam strength in woven fabrics and knitted fabrics-causes of yarn slippage in woven fabrics-Bow and Skewness -Yarn severance and Seam Puckering-reasons for seam puckering-causes of snagging-effect of physical properties on puckering

## VIII. STATISTICAL TOOLS AND QUALITY CONTROL

Causes of variation in textiles- calculation of standard deviation, variance, coefficient of variation - control limits and specification limits- control charts-types of control charts- Control charts for averages, range, fraction defective, number of defects -control line, Upper control limit and lower control limit for each chart- chance causes and assignable causes-Process capability- Six sigma - characteristics of normal distribution curve-problems on significance testing for mean and dispersion–correlation - Methods of studying correlation- uses of correlation- calculation of Karl Pearson coefficient of correlation- Concept and importance of quality- definitions of basic terms related to quality-elements of quality management -divisions of cost of quality- quality costs in relation to the garment manufacturing – benefits and importance of standards-sources of standards for textiles-Quality Management Systems - ISO 9000 Standards- TQM- quality improvement program by Kaizen- 5 S quality system- quality circles- -Seven tools of quality Improvement-Flow chart, Cause and effect diagram, Pareto diagram, Check sheets, Histogram, Scatter diagram and Run charts.

## IX. TEXTILE MATHEMATICS

Micronaire - yarn diameter- problems on direct and Indirect yarn count systems - conversion factors-count of folded yarn – Calculations in Cotton spinning - bale density -blows / inch of a beater - Waste % and cleaning efficiency of a beater and blow room –cleaning efficiency of a card -surface speed - drafts in various departments - creel table draft, break draft, main draft, web draft and total draft - Draft constant and change wheel –hank of delivery sliver – linear density of lap –production and production efficiencies of various machines in spinning–

Calculation of twist -twist in roving and yarn - relation between twist and count - front roller delivery - yarn realization -calculations in cone winding - time required, number of drums required to wind given weight of yarn -calculation of Yarn tension, clearer setting -clearing efficiency- Spin plan - Average count of warp -Weight of yarn on beam- beam count-Minimum mass of yarn for supply package-Time to complete a beam -Warping machine running efficiency-Proportion of warper's beam to slasher beam - width of section and number of ends in the section -Number of sections to be made -Size pick up & size add on-Weight of size required -Count of sized warp- -running efficiency of warping machine and sizing machine -Number of looms that could be fed by a slasher sizing machine – Take up and regain of warp and weft - Relation between reed count and reed width-Relation between Loom pick and picks per inch in the cloth -Average speed, average reed space, average picks-production of a loom -time required to weave given length of warp -length of warp required per loom per hour -warp and weft crimp in woven fabric- Weight of warp and weft required to produce given piece of fabric - cover factor-No of machines required for a target production - Production calculations in Garment manufacture- production target, operator efficiency, line efficiency, machine efficiency, machine productivity, Labour productivity, standard time, Labour cost per unit, fabric consumption for producing a garment and thread consumption

## **X. KNITTING & NONWOVEN TECHNOLOGY**

Basic terms of Knitting - properties of knitted structures - weft knitting and warp knitting-functional elements used on a (weft) knitting machine -loop forming sequence of knitting needle - Basic weft knit structures-Representation of weft knit structures- characteristics of single jersey structures -Warp Knitting- principle of producing basic warp knit fabric -functional elements of Tricot and Rachel machines - knitting cycles of tricot and Raschel machine - differences between warp knits and woven fabrics -Apparel and non-apparel uses of knitted fabrics- Process stages in nonwoven manufacture- classification of nonwoven fabrics - methods of web formation - methods of bonding the web - principle of producing needle punched nonwovens- techniques of adhesive bonding , principle of hot calendar thermal bonding- Extrusion nonwovens- Spun bonding and spun laced techniques -Melt blown techniques - structure and general characteristics of nonwovens- applications and Scope of non-woven fabrics- Comparison between Non-Woven & Woven Fabrics

## **XI. TECHNICAL TEXTILES**

Classification of technical Textiles - scope of textile fibres for use in technical applications - yarn manufacturing technologies of producing technical yarns - fabric structures (woven, knitted and nonwoven) used for technical applications -various finishes and coatings for fabrics for Technical applications -scope and utility of various technical textiles-applications of nonwovens in Technical Textiles- Classification of Medical textiles- product, fibre type and manufacturing system of implantable medical textile and Non-implantable medical textiles. Health care Hygiene products -fibre type and construction of suture -extra corporeal devices- requirements of fibres for medical textiles - scope and advantages of using textiles for filtration -theory, principles and process of dust collection in aerosol filtration - types fabric cleaning mechanisms- considerations in selection and design of fabric filters- Classification of geo synthetics - functions of geo textiles and their application fields - structure and uses of different types of geo synthetics - properties of Geo Textiles - advantages of Geo textiles made by Jute.Inherently flame-retardant fibres - the process of flame retardation of conventional textile fibres -water proof breathable fabrics - application of textiles for survival - physical requirements of military textiles-environmental requirements of military textiles for heat,flame and hazards- ballistic textile - typical military textiles- Requirements of textiles for transportation - textiles used in road transportation - application of textiles in Architecture and Construction - application of textiles in Agriculture, Sports and Recreation - requirements of sports surfaces structure and manufacturing of tyre cards - classification of textile composite reinforcement - the application of textile structural composites

## ANNEXURE – IV

### INSTRUCTIONS TO CANDIDATES:

#### A) GENERAL INSTRUCTIONS TO CANDIDATES

- 1) Candidates are directed to follow the Commission's Website (<https://www.tspsc.gov.in>) regularly to know the latest developments regarding the Recruitment, dates of Examination, calling of candidates for verification of Certificates/ Medical Boards, Results etc.
- 2) The Hall Ticket must be presented for entry into the examination hall alongwith one original valid Photo identification card issued by Government i.e., Passport, Pan Card, Voter ID, Aadhaar Card, Government Employee ID or Driving License etc., without fail.
- 3) Candidates are strictly not allowed inside the Examination centre after closing the gate.
- 4) **EDIT OPTION TO THE CANDIDATES:** The applicants should follow the TSPSC website regularly to utilize the edit option to rectify the mistakes viz., Biodata particulars/Data corrections / Omissions etc., in the application, if the facility is given by the Commission. If the edit option facility is not utilized by the candidates, the TSPSC is not responsible and the data already available is treated as final. After the due date, Data corrections through Online/Paper representations or Corrections on the Nominal Rolls in the examination hall will not be accepted under any circumstances. No correspondence will be entertained in this matter.
- 5) There will be a common examination for Paper-I i.e., General Studies as decided by the Commission, whenever required.
- 6) The candidates 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 candidate in his/her application have been accepted by the Commission as true and correct. The candidates 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 verification, may lead to disqualification.
- 7) The candidates are not allowed to bring any Electronic devices such as Smart / Mobile phones, Calculators, tablets, iPad, Bluetooth, pagers, watches to examination centre. Loaning and interchanging of articles among the candidates is not permitted in the examination hall and any form of malpractice will not be permitted in the exam hall.
- 8) The candidates are expected to behave in an orderly and disciplined manner while writing the examination. If any candidate takes away Answer Sheet of OMR based examination, the candidature will be rejected. In case of impersonation/ disorder/ rowdy behavior during Examination, cases shall be booked in the Police Station concerned, apart from disqualifying his /her candidature.
- 9) Candidates trying to use unfair means shall be disqualified from the selection. No correspondence whatsoever will be entertained from the candidates.
- 10) The Commission is also empowered to invoke the penal provisions of the T.S. Public Examinations (Prevention of Malpractices and Unfair means) Act, 1997 (Act No.25/1997) for matters connected therewith or incidental thereto and as per the Rules of Procedure of TSPSC published in Telangana Gazette No: 60 dated 28/12/2015 in respect of this Notification.
- 11) (i) The candidates who are totally blind are allowed to write the examination with the help of scribe provided by TSPSC and 20 minutes extra time is permitted to them per hour.
  - (ii) Scribe will be provided by TSPSC to those candidates who do not have both the upper limbs for Orthopedically Handicapped. However, no extra time will be granted to them.
  - (iii) Scribe will be provided to the above category of candidates who applied for scribe facility in the online application only.
  - (iv) An extra time of 20 minutes per hour is also permitted for the candidates with locomotor disability and CEREBRAL PALSY where dominant (writing) extremity is affected for the extent slowing the performance of function (**Minimum of 40% impairment**). Scribe is allowed to such candidates also.
  - (v) The scribe should be from an academic discipline other than that of the candidate and

the academic qualification of the scribe should be one grade lower than the stipulated eligibility criteria.

- (vi) The candidate as well as the scribe will have to give a suitable undertaking confirming the rules applicable.

## **B) INSTRUCTIONS TO CANDIDATES REGARDING OMR BASED EXAMINATION**

- 1) The candidates have to report to the examination venue at least 30 minutes before the commencement of examination, to record their Photo Image/thumb impression on Biometric system.
- 2) The candidate should satisfy the Invigilator of his identity with reference to the Signature and Photograph available on the Nominal Roll and Hall Ticket.
- 3) The candidates should go through the instructions given on the cover page of test booklet and OMR Answer Sheet which will be provided to him/her in the examination hall and carefully write his/her Hall Ticket Number, Subject / Paper Code, Question Booklet Number, Name of the Examination Centre etc., on the OMR Answer Sheet. The candidates have to USE BALL POINT PEN (BLUE/BLACK) ONLY to fill up relevant columns on the Answer Sheet including MARKING OF THE ANSWERS. Bubbling by Pencil / Ink Pen /Gel Pen is not permitted in the examination.
- 4) The candidate must write all the relevant columns in the Answer sheet and also encode (bubble) correctly such as Hall Ticket Number, Question Booklet Series and Paper Code on the OMR Answer Sheet carefully and to Sign in the space provided for on Side-1 of the Answer Sheet and ensure the Signature of the Invigilator, etc., on it, failing which the Answer sheet will be rejected. Use of whitener / eraser / chalk-powder etc., is strictly prohibited on the OMR Answer sheet/ Question Paper.
- 5) Candidate should encode the Hall-Ticket Number and Paper Code first carefully on OMR Answer Sheet. After receiving the Question Paper only, candidate should verify and encode Question Booklet Number on the OMR Answer Sheet.
- 6) OMR Answer sheets cannot be replaced under any circumstances in case of wrong bubbling.
- 7) If there is any defect in the Test Booklet or OMR Answer Sheet, please ask the invigilator for replacement immediately.
- 8) The OMR Answer sheets are to be scanned (valued) with Optical Mark Reader. The Digital copy of OMR Answer Sheets will be made available on the Commission's website immediately after completion of the image scanning.
- 9) No candidate should leave the examination hall till expiry of fulltime. After writing the examination the candidate has to handover the OMR Answer sheet to the invigilator in the examination hall. If any candidate takes away the OMR Answer sheet, his/her candidature will be rejected.
- 10) The Commission would be analyzing the responses of a candidate with other appeared candidates to detect patterns of similarity. If it is suspected that the responses have been shared and the scores obtained are not genuine/ valid, the Commission will invalidate the OMR Answer Sheet and cancel his/ her candidature.

## **C) INSTRUCTIONS FOR CANDIDATES REGARDING CBRT EXAMINATION**

- 1) Candidates shall report at the venue one hour (60 minutes) before the Commencement of Examination as the candidates have to undergo certain procedural formalities required for CBRT examination.
- 2) Date and Time of the Examination are mentioned in the Hall-Ticket
- 3) The examination link with the login screen will already be available on your system. Please inform the invigilator if this is not the case.
- 4) 10 minutes prior to the exam, you'll be prompted to login. Please type the Login ID (H T No.) and the Password (Password for Candidate will be given on exam day) to proceed further.
- 5) Invigilator will announce the password at 09.50 AM and 02.20 PM in cases if Examination is at 10:00 A.M and 2:30 P.M respectively.
- 6) Copying or noting down questions and/or options is not allowed. Severe action will be taken if any candidate is found noting down the questions and/or options.
- 7) After logging in, the following will be displayed on your Computer screen:
  - 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.
- 8) After reading the instructions, you have to use the mouse to answer the multiple-

- choice type questions having FOUR alternative answer choices.
- 9) To answer any numerical answer type question, you need to use the virtual numeric key pad and the mouse.
  - 10) On the online exam question screen, the timer will display the balance time remaining for the completion of exam.
  - 11) The question numbers are color coded 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 candidate for review to be answered later.
    - Violet (Circle with a Tick mark) - Question answered but marked by candidate for review.
  - 12) After answering a question, click the SAVE & NEXT button to save your response and move onto the next question.
  - 13) Click on Mark for Review & NEXT to mark your question for review, and then go to the next question.
  - 14) To clear any answer chosen for a particular question, please click on the CLEAR RESPONSE button.
  - 15) 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.
  - 16) 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.
  - 17) You may view INSTRUCTIONS at any point of time during exam, by clicking on the INSTRUCTIONS button on your screen.
  - 18) The SUBMIT button will be activated after 150 Minutes. It will continue for an additional 50 Minutes for PH candidates eligible for compensatory time. Please keep checking the timer on your screen.
  - 19) In case of automatic or emergency log out, all your attempted questions and their responses will be saved. And also, the exam will start from the time where it had stopped.
  - 20) 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.
  - 21) Please don't touch the key board as your exam ID will get locked. If your ID gets locked, please inform your invigilator who will help in unlocking your ID and then you can continue with the exam.
  - 22) Please inform the invigilator in case of any technical issues.
  - 23) Please do not talk to or disturb other candidates.
  - 24) In case you are carrying articles other than the admit card, photo identity proof and pen, please leave them outside the exam room.
  - 25) These are model instructions and candidates have to follow latest instructions issued along with Hall tickets

**ANNEXURE-V****LIST OF SCHEDULED CASTES AND SCHEDULED TRIBES**

(G.O. MS. NO. 5 Scheduled Castes Development (POA.A2) Dept., Dt. 08/08/2015 read with G.O. Ms. No. 11, Scheduled Castes Development (POA.A2) Dept., Dt. 17/09/2014 and G.O. Ms. No. 2 Scheduled Castes Development (POA.A2) Dept., Dt. 22.01.2015)

**LIST OF SCHEDULED CASTES**

1. Adi Andhra
2. Adi Dravida
3. Anamuk
4. Aray Mala
5. Arundhatiya
6. Arwa Mala
7. Bariki
8. Bavuri
9. Beda (Budga) Jangam
10. Bindla
11. Byagara, Byagari
12. Chachati
13. Chalavadi
14. Chamar, Mochi, Muchi, Chamar-Ravidas, Chamar- Rohidas
15. Chambhar
16. Chandala
17. Dakkal, Dokkalwar
18. Dandasi
19. Dhor
20. Dom, Dombara, Paidi, Pano
21. Ellamalawar, Yellammalawandlu
22. Ghasi, Haddi, Relli, Chanchandi
23. Godari
24. Gosangi
25. Holey
26. Holey Dasari
27. Jaggali
28. Jambuvulu
29. Kolupulvandlu, Pambada, Pambanda, Pambala
30. Madasi Kuruva, Madari Kuruva
31. Madiga
32. Madiga Dasu, Mashteen
33. Mahar
34. Mala, Mala Ayawaru
35. Mala Dasari
36. Mala Dasu
37. Mala Hannai
38. Malajangam
39. Mala Masti
40. Mala Sale, Nethani
41. Mala Sanyasi
42. Mang
43. Mang Garodi
44. Manne
45. Mashti
46. Matangi
47. Mehtar
48. Mitha Ayyalvar
49. Mundala
50. Paky, Moti, Thoti
51. Pamidi
52. Panchama, Pariah
53. Relli
54. Samagara
55. Samban
56. Sapru
57. Sindhollu, Chindollu
58. Yatala
59. Valluvan

**LIST OF SCHEDULED TRIBES**

1. Andh, Sadhu Andh
2. Bagata
3. Bhil
4. Chenchu
5. Gadabas, Bodo Gadaba, Gutob Gadaba, Kallayi Gadaba, Parangi Gadaba, Kathera Gadaba, Kapu Gadaba
6. Gond, Naikpod, Rajgond, Koitur
7. Goudu (in the Agency tracts)
8. Hill Reddis
9. Jatapus
10. Kammara
11. Kattunayakan
12. Kolam, Kolawar
13. Konda Dhoras, Kubi
14. Konda Kapus
15. Kondareddis
16. Kondhs, Kodi, Kodhu, Desaya Kondhs, Dongria Kondhs, Kuttiya Kondhs, Tikiria Kondhs, Yenity Kondhs, Kuvinga
17. Kotia, Bentho Oriya, Bartika, Dulia, Holya, Sanrona, Sidhopaiko
18. Koya, Doli Koya, Gutta Koya, Kammara Koya, Musara Koya, Oddi Koya, Pattidi Koya, Rajah, Rasha Koya, Lingadhari Koya (ordinary), Kottu Koya, Bhine Koya, Rajkoya
19. Kulia
20. Manna Dhora
21. Mukha Dhora, Nooka Dhora
22. Nayaks (in the Agency tracts)
23. Pardhan
24. Porja, Parangiperja
25. Reddi Dhoras
26. Rona, Rena
27. Savaras, Kapu Savaras, Maliya Savaras, Khutto Savaras
28. Sugalis, Lambadis, Banjara
29. Thoti (in Adilabad, Hyderabad, Karimnagar, Khammam, Mahbubnagar, Medak, Nalgonda, Nizamabad and Warangal districts)
30. Yenadis, Chella Yenadi, Kappala Yenadi, Manchi Yenadi, Reddi Yenadi
31. Yerukulas, Koracha, Dabba Yerukula, Kunchapuri Yerukula, Uppu Yerukula
32. Nakkala, Kurvikaran.

**LIST OF SOCIALLY AND EDUCATIONALLY BACKWARD CLASSES**

As per G.O. Ms. No. 16 Backward Classes Welfare (OP) Department, Dated:11.03.2015 and read with G.O.MS.No. 34, Backward Classes Welfare (OP) Department, Dated: 08/10/2015, G.O. Ms. No. 4 Backward Classes Welfare (OP) Department, Dated: 30/01/2016, G.O.Ms.No. 3 Backward Classes Welfare (B) Department, Dated: 09-09-2020

**STATE LIST OF BCs**

**(List of Backward Classes of Telangana State)**

**GROUP-A**

**(Aboriginal Tribes, Vimuktha Jathis, Nomadic and Semi-Nomadic Tribes etc.)**

- 1 Agnikulakshatriya, Palli, Vadabaliya, Bestha, Jalari, Gangavar, Gangaputra, Goondla, Vanyakulakshatriya (Vannekapu, Vannerreddi, Pallikapu, Pallireddi) Neyyala, Pattapu.
- 2 Balasanthu, Bahurupi
- 3 \*[Bandara]
- 4 Budabukkala
- 5 Rajaka (Chakali, Vannar)
- 6 Dasari (formerly engaged in Bikshatana i.e., Beggary)
- 7 Dommara
- 8 Gangiredlavaru
- 9 Jangam (whose traditional occupation is begging)
- 10 Jogi
- 11 Katipapala
- 12 \*[Korcha]
- 13 Lambada or Banjara in Telangana area (deleted and included in ST list vide. G.O.Ms.No.149, SW, Dt.03.05.1978)
- 14 Medari or Mahendra
- 15 Mondivaru, Mondibanda, Banda

- 16 Nayi-Brahmin/Nayee-Brahmin (Mangali), Mangala and Bhajantri
- 17 Nakkala (deleted vide. G.O.Ms.No.21, BCW (C2) Dept., Dt.20.06.2011, since it is included in the list of Scheduled Tribes at Sl.No.34 vide. Scheduled Castes and Scheduled Tribes Order (Amendment) Act, 2002 (Central Act No.10 of 2003)
- 18 Vamsha Raj / Pitchiguntla
- 19 Pamula
- 20 Pardhi (Nirshikari)
- 21 Pambala
- 22 Peddammandlu, Devaravandlu, Yellammavandlu, Mutyalammavandlu, Dammali / Dammala / Dammula / Damala
- 23 Veeramushti (Nettikotala), Veerabhadreeya
- 24 Valmiki Boya (Boya, Bedar, Kirataka, Nishadi, Yellapi, Pedda Boya), Talayari, Chunduvallu (Yellapi and Yellapu are one and the same as clarified vide. G.O.Ms.No.61, BCW (M1) Dept., Dt.05.12.1996)
- 25 Yerukalas in Telangana area (deleted and included at Sl.No.31 in the list of STs)
- 26 Gudala
- 27 Kanjara – Bhatta
- 28 \*[Kalinga]
- 29 Kepmare or Reddika
- 30 Mondepatta
- 31 Nokkar
- 32 Pariki Muggula
- 33 Yata
- 34 Chopemari
- 35 Kaikadi
- 36 Joshinandiwalas
- 37 Odde (Oddilu, Vaddi, Vaddelu), Vaddera, Vaddabhovi, Vadiyaraj, Waddera
- 38 Mandula
- 39 Mehtar (Muslim)
- 40 Kunapuli
- 41 Patra
- 42 \*[Kurakula]
- 43 \*[Pondara]
- 44 \*[Samanthula /Samantha/ Sountia / Sauntia]
- 45 Pala-Ekari, Ekila, Vyakula, Ekiri, Nayanivaru, Palegaru, Tolagari, Kavali (area confined to Hyderabad and Rangareddy Districts only)
- 46 Rajannala, Rajannalu (area confined to Karimnagar, Warangal, Nizamabad and Adilabad Districts only)
- 47 Bukka Ayyavars
- 48 Gotrala
- 49 Kasikapadi / Kasikapudi (area confined to Hyderabad, Rangareddy, Nizamabad, Mahaboobnagar and Adilabad Districts only)
- 50 Siddula
- 51 Sikligar/ Saikalgar
- 52 Poosala (included vide. G.O.Ms.No.16, BCW(C2) Dept., Dt.19.02.2009 by deleting from Sl.No.24 under Group-D)
- 53 \*[Aasadula / Asadula]
- 54 \*[Keuta / Kevuto / Keviti]
- 55 Orphan and Destitute Children who have lost their parents before reaching the age of ten and are destitute; and who have nobody else to take care of them either by law or custom; and also who are admitted into any of the schools or orphanages run by the Government or recognised by the Government.
- 56 Addapuvaru
- 57 Bagothula/ Bhagavathula
- 58 Bail Kammara/ Ghisadi/ Gadiya Lohar
- 59 Enooti/ Yenetivallu
- 60 Ganjikuti/ Ganjikutivaru
- 61 Gouda Jeti
- 62 Kakipadagala
- 63 Patamvaru/ Masaiahlu
- 64 Odd/ Od/ Oad
- 65 Sonnayila/ Sannayila/ Sannayollu
- 66 Sri Kshatriya Ramajogi/ Ramajogi/ Ramajogula
- 67 Theracheerala/ Telsoori/ Baikani
- 68 Tholubommalatavaru/ Boppala

**GROUP-B**  
**(Vocational Groups)**

- 1 \*[Achukatlavandlu]
- 2 Aryakshatriya, Chittari, Giniyar, Chitrakara, Nakhas
- 3 Devanga
- 4 Goud [Ediga, Gouda (Gamalla), Kalalee, Gounda, **[\*Settibalija of Visakhapatnam, East Godavari, West Godavari and Krishna districts]** and Srisayana (Segidi)
- 5 Dudekula, Laddaf, Pinjari or Noorbash
- 6 Gandla, Telikula, Devathilakula
- 7 Jandra
- 8 Kummara or Kulala, Salivahana
- 9 Karikalabhakthulu, Kaikolan or Kaikala (Sengundam or Sengunther)
- 10 Karnabhakthulu
- 11 Kuruba or Kuruma
- 12 \*[Nagavaddilu]
- 13 Neelakanthi
- 14 Patkar (Khatri)
- 15 Perika (Perika Balija, Puragiri kshatriya)
- 16 Nessi or Kurni
- 17 Padmasali (Sali, Salivan, Pattusali, Senapathulu, Thogata Sali)
- 18 Srisayana (Segidi) (deleted vide. G.O.Ms.No.63, BCW (M1) Dept., Dt.11.12.1996 and added to Sl.No.4 of Group-B)
- 19 Swakulasali
- 20 Thogata, Thogati or Thogataveerakshatriya
- 21 Viswabrahmin (Ausula, Kamsali, Kammari, Kanchari, Vadla or Vadra or Vadrangi and Silpis), Viswakarma
- 22 \*[Kunchiti / Vakkaliga / Vakkaligara / Kunchitiga]
- 23 Lodh/ Lodhi/ Lodha (area confined to Hyderabad, Rangareddy, Khammam and Adilabad Districts only)
- 24 Bondili
- 25 Are Marathi, Maratha (Non-Brahmins), Arakalies and Surabhi Natakavallu
- 26 Neeli (included vide. G.O.Ms.No. 43, BCW (C2) Dept., Dt.07.08.2008 by deleting from Group D at Sl.No.22)
- 27 Budubunjala / Bhunjwa / Bhadbhunja (area confined to Hyderabad and Rangareddy Districts only)
- 28 \*[Gudia / Gudiya]

**GROUP-C**

Scheduled Castes converts to Christianity and their progeny

**GROUP-D**  
**(Other Classes)**

- 1 \*[Agaru]
- 2 Arekatika, Katika, Are-Suryavamshi
- 3 \*[Atagara]
- 4 Bhatraju
- 5 Chippolu (Mera)
- 6 \*[Gavara]
- 7 \*[Godaba]
- 8 Hatkar
- 9 \*[Jakkala]
- 10 Jingar
- 11 \*[Kandra]
- 12 Koshti
- 13 Kachi
- 14 Surya Balija (Kalavanthula), Ganika
- 15 Krishnabalija (Dasari, Bukka)
- 16 \*[Koppulavelamas]
- 17 Mathura
- 18 Mali (Bare, Barai, Marar and Tamboli)
- 19 Mudiraj, Mutrasi, Tenugollu
- 20 Munnurukapu
- 21 \*[Nagavasam (Nagavamsa)]
- 22 Nelli (deleted vide. G.O.Ms.No.43, BCW(C2) Dept., Dt.07.08.2008 and added at Sl.No.26 in Group 'B')
- 23 \*[Polinati Velamas of Srikakulam and Visakhapatnam districts]

- 24 Poosala caste (deleted vide. G.O.Ms.No.16, BCW(C2) Dept., Dt.19.02.2009 and included at S.No.52 under Group-A)
- 25 Passi
- 26 Rangarez or Bhavasara Kshatriya
- 27 Sadhuchetty
- 28 Satani (Chattadasrivaishnava)
- 29 Tammali (Non-Brahmins) (Shudra caste) whose traditional occupation is playing musical instruments, vending of flowers and giving assistance in temple service but not Shivarchakars
- 30 \*[Turupukapus or Gajulakapus]
- 31 Uppara or Sagara
- 32 Vanjara (Vanjari)
- 33 Yadava (Golla)
- 34 Are, Arevallu and Arollu
- 35 \*[Sadara / Sadaru]
- 36 \*[Arava]
- 37 Ayyaraka (area confined to Khammam and Warangal Districts only)
- 38 Nagaralu (area confined to Hyderabad and Rangareddy Districts only)
- 39 Aghamudian, Aghamudiar, Agamudivellalar and Agamudimudaliar (including Thuluva Vellalas) (area confined to Hyderabad and Rangareddy Districts only)
- 40 \*[Beri Vysya / Beri Chetty]
- 41 \*[Atirasa]
- 42 Sondi / Sundi
- 43 Varala
- 44 Sistakaranam
- 45 Lakkamarikapu
- 46 Veerashaiva Lingayat / Lingabalija
- 47 Kurmi
- 48 Aheer/ Aheer Yadav
- 49 Govili/Govlii/ Gouli/Gavli
- 50 Kulla Kadagi/ Kulle Kadigi/ Chittepu
- 51 Sarollu/Soma Vamsha Kshatriya

#### **GROUP-E**

**(Socially and Educationally Backward Classes of Muslims)  
(Subject to outcome of Civil Appeal No(s).2628-2637/2010 etc., pending before the  
Hon'ble Supreme Court of India)**

- 1 Achchukattalavandlu, Singali, Singamvallu, Achchupanivallu, Achchukattuvaru, Achukatlavandlu
- 2 Attar Saibulu, Attarollu
- 3 Dhobi Muslim/ Muslim Dhobi/ Dhobi Musalman, Turka Chakla or Turka Sakala, Turaka Chakali, Tulukka Vannan, Tsakalas, Sakalas or Chakalas, Muslim Rajakas
- 4 Faqir, Fhakhir Budbudki, Ghanti Fhakhir, Ghanta Fhakhiru, Turaka Budbudki, Darvesh, Fakeer
- 5 Garadi Muslim, Garadi Saibulu, Pamulavallu, Kani-Kattuvallu, Garadollu, Garadiga
- 6 Gosangi Muslim, Phakeer Sayebulu
- 7 Guddi Eluguvallu, Elugu Bantuvallu, Musalman Keelu Gurrallavallu
- 8 Hajam, Nai, Nai Muslim, Navid
- 9 Labbi, Labbai, Labbon, Labba
- 10 Pakeerla, Borewale, Deera Phakirlu, Bonthala
- 11 Qureshi, Kureshi/ Khureshi, Khasab, Marati Khasab, Muslim Katika, Khatik Muslim
- 12 Shaik/ Sheikh
- 13 Siddi, Yaba, Habshi, Jasi
- 14 Turaka Kasha, Kakkukotte Zinka Saibulu, Chakkitakanevale, Terugadu Gontalavaru, Thirugatigantla, Rollaku Kakku Kottevaru, Pattar Phodulu, Chakketakare, Thuraka Kasha

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\* omitted vide G.O Ms.No.3, BCW(OP) Dept., Dated:14.08.2014

- N.B.:1) The above list is for information and subject to confirmation with reference to G.O.Ms.No.58, SW(J) Department, dated 12.05.1997 and time to time orders.
- 2) On account of any reason whatsoever in case of any doubt/ dispute arising in the matter of community status (SC/ST/BC/OC) of any candidate, subject to satisfaction with regard to relevant Rules and Regulations in force the decision of the Commission shall be final in all such cases.

**ANNEXURE – VI**

**List of recognized sports disciplines for Two Percent (2%) reservation in Direct Recruitment in Government Departments / Govt. Institutions as per G.O. Ms. No. 74, Youth Advancement, Tourism & Culture (Sports) Department Dated:09-08-2012**

- (1) FOOTBALL
- (2) HOCKEY
- (3) VOLLEYBALL
- (4) HANDBALL
- (5) BASKET BALL
- (6) TENNIS
- (7) TABLE TENNIS
- (8) SHUTTLE BADMINTON
- (9) KABBADI
- (10) ATHLETICS
- (11) SWIMMING
- (12) GYMNASTICS
- (13) WEIGHTLIFTING
- (14) WRESTLING
- (15) BOXING
- (16) CYCLING
- (17) ROWING
- (18) SHOOTING
- (19) FENCING
- (20) ROLLER SKATING
- (21) SAILING / YATCHING
- (22) ARCHERY
- (23) CRICKET
- (24) CHESS
- (25) KHO-KHO
- (26) JUDO
- (27) TEAKWANDO
- (28) SOFTBALL
- (29) BODY BUILDING (Uniform Services like Police, Excise etc).

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