**ANDHRA PRADESH POWER GENERATION CORPORATION LIMITED**
**VIDYUTH SOUDHA : : HYDERABAD**

## NOTIFICATION

APGENCO is the largest Power Generating Company of Andhra Pradesh State with installed capacity of 4588 MW, comprising 2810 MW (61.25%) Thermal, 1772.6 MW (38.63%) Hydro and 5 MW (0.12%) Solar Power Stations, contributes 41% of total energy requirement of Andhra Pradesh and want to be the best power utility in the Country and one of the best in the World, offers excellent opportunities to Professionals.

| Position | No. of Vacancies |
|---|---|
| Notification No.1/CGM(Adm,IS&ERP)/2017<br><br>Trainee Assistant Engineer<br>(for Engineering Graduates in<br>Electrical, Mechanical, Electronics & Civil) | **94**<br><br>**(LR- 16 + GR- 78 )** |

**LR:** Limited Recruitment **GR:** General Recruitment

**Note:** The above vacancies are subject to variation based on the necessity and shall be filled as per Rule of Reservation in vogue.

**Date of Written Test** : **23.04.2017**

**How to apply** : The candidate has to login to the website http://www.apgenco.gov.in and click on **APPLY ONLINE** link or directly visit http://apgenco.cgg.gov.in to view detailed notification, user guide and to submit application form. Online application is accessible from 06.03.2017 to 05.04.2017.

**K VIJAYANAND**
**MANAGING DIRECTOR**

**Notification No.1/CGM(Adm,IS&ERP)/2017, Dated:04.03.2017**

**Break up of Vacancies for the post of Trainee Assistant Engineer:**

**Electrical Branch:**

| Zones | | OC | | BC-A | | BC-B | | BC-C | | BC-D | | BC-E | | SC | | ST | | PH | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | G | W | G | W | G | W | G | W | G | W | G | W | G | W | G | W | G | W | |
| 1 | LR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | GR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | |
| 2 | LR | - | - | 1NL | 1L | - | - | - | - | - | - | 1L | - | - | - | - | - | 1L | - | 24 |
| | GR | 5 | 3 | 1 | - | 1 | 1 | 1 | - | - | 1 | - | 1 | 2 | 1 | 1 | 1 | - | 1 | |
| 3 | LR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | GR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | |
| 4 | LR | - | 1L | - | - | - | 1L | - | - | - | - | - | - | 1NL | - | - | - | - | - | 20 |
| | GR | 7 | 2 | - | 1 | 1 | - | - | - | 2 | - | 1 | - | 1 | 1 | 1 | - | - | - | |

**Mechanical Branch:**

| Zones | | OC | | BC-A | | BC-B | | BC-C | | BC-D | | BC-E | | SC | | ST | | PH | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | G | W | G | W | G | W | G | W | G | W | G | W | G | W | G | W | G | W | |
| 1 | LR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 |
| | GR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | |
| 2 | LR | - | - | - | - | - | - | - | - | - | - | - | - | 1L | - | - | - | - | 1L | 14 |
| | GR | 4 | 2 | 1 | - | 1 | - | - | - | - | - | - | - | 2 | - | - | 1 | 1 | - | |
| 3 | LR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | GR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | |
| 4 | LR | - | 1NL | - | - | 1NL | - | - | - | - | - | - | - | - | - | - | - | 1NL | - | 11 |
| | GR | 3 | 2 | 1 | - | - | 1 | - | - | - | - | - | - | 1 | - | - | - | - | - | |

**Electronics Branch:**

| Zones | | OC | | BC-A | | BC-B | | BC-C | | BC-D | | BC-E | | SC | | ST | | PH | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | G | W | G | W | G | W | G | W | G | W | G | W | G | W | G | W | G | W | |
| 1 | LR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | GR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | |
| 2 | LR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 |
| | GR | 1 | - | - | - | - | - | 1 | - | - | - | - | - | 1 | - | - | - | - | - | |
| 3 | LR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | GR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | |
| 4 | LR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 |
| | GR | 1 | 1 | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | |

**Civil Branch:**

| Zones | | OC | | BC-A | | BC-B | | BC-C | | BC-D | | BC-E | | SC | | ST | | PH | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | G | W | G | W | G | W | G | W | G | W | G | W | G | W | G | W | G | W | |
| 1 | LR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1L | 2 |
| | GR | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | |
| 2 | LR | - | 1NL | - | - | 1L | - | - | - | - | - | - | - | - | - | - | - | - | - | 8 |
| | GR | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | - | 1 | - | - | - | |
| 3 | LR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 |
| | GR | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | |
| 4 | LR | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1L | 7 |
| | GR | 1 | 1 | - | - | - | - | 1 | - | - | 1 | - | 1 | 1 | - | - | - | - | - | |

**G**:General || **W**:Woman || **LR**:Limited Recruitment || **GR:**General Recruitment || **L**:Local || **NL**:Non-Local

**3. Scale of Pay** : Rs. 41155-1700-44555-1985-54480-2280-63600

**4. Age** : Shall not be more than 42 years as on 01.03.2017. Upper age limit will be relaxed up to 5 years for SC/ST/BC candidates and 10 years in respect of physically challenged (Handicapped) candidates.

**5. Special instructions to the candidates appearing for the written test:**

- The candidate will be supplied carbonless OMR Answer Sheet consisting of two copies, the original copy and the duplicate copy below. Do not attempt to separate or displace them while answering. After completion of examination he/she should hand over the Original OMR Sheet (top sheet) to the invigilator and carry the bottom sheet (duplicate) for his/her record.

- If any candidate in violation of the above instructions takes away the original OMR Sheet his/her candidature to the recruitment will be rejected besides invocation of penal provisions including debarment of the candidate for all future recruitments to be conducted by the APGENCO.

- The candidate has to use **Ball Point Pen (Blue/Black)** for filling up of all blocks including bubbling the answer etc. in the OMR Sheet.

**Note:**

1. The Recruitment will be processed as per this Notification and also as per the rules and instructions issued by the Government/ Corporation from time to time.

2. **Caste & Community:** Community certificate issued by the competent authority should be submitted at appropriate time. Backward Classes, Schedule Castes and Schedule Tribes belonging to other States are not entitled for reservation.

3. **Zonal/Local**: The selection List will be drawn in two parts. The first part will comprise 40% of the posts consisting of combined merit list of local as well as non-local and the remaining second part will comprise the balance 60% of the posts consisting of locals only and the posts will be filled only following the Rule of Reservation.

4. The whole Recruitment and selection process is carried out with utmost, secrecy and confidentiality so as to ensure that the principle of merit is scrupulously followed. A candidate shall be disqualified for appointment, if he/she himself/herself or through relations or friends or any others has canvassed are endeavored to enlist for his/her candidature, extraneous support, whether from official or non-official sources for appointment to this service.

**5. Educational Qualifications:**

| | |
|---|---|
| **Electrical -** | Must possess B.E/B.Tech/A.M.I.E., Electrical & Electronics Engineering or equivalent qualification from any recognized University in India as on 01.03.2017 under regular basis. |
| **Mechanical -** | Must possess B.E/B.Tech/A.M.I.E., Mechanical Engineering or equivalent qualification from any recognized University in India as on 01.03.2017 under regular basis. |

| | |
|---|---|
| **Electronics -** | Must possess B.E/B.Tech./A.M.I.E., in Electronics & Communication Engineering/ Instrumentation & Controls Engineering/ Electronics & Instrumentation Engineering/ Electronics & Control Engineering/ Instrumentation Engineering/Electronics Instrumentation & Power/ Power electronics / Computer Science Engineering/Computer Science & information Technology or equivalent qualification from any recognized University in India as on 01.03.2017 under regular basis. |
| **Civil -** | Must possess B.E/B.Tech/A.M.I.E., Civil Engineering or equivalent qualification from any recognized University in India as on 01.03.2017 under regular basis. |

**6. Fee :**

| | |
|---|---|
| The OC candidates | Should pay an amount of Rs.500/-(Rupees five hundred only) (non-refundable) (Rs.350/- towards examination fee and Rs.150/- towards application registration fee). |
| Physically Challenged (having disability of more than 40% and above) and candidates belonging to BC, SC & ST communities | Should pay an amount of Rs.150/-(Rupees one hundred and fifty only) (non-refundable) towards application registration fee. |
| Candidates belonging to other States | Should pay an amount of Rs.500/-(Rupees five hundred only) (non-refundable) (Rs.350/- towards examination fee and Rs.150/- towards application registration fee). |

The applicant should pay the prescribed "Registration Fee" through Payment Gateway (Bill Desk/Atom). Candidates need to visit the payment link on website http://apgenco/cgg.gov.in and provide basic details like Name, Father's Name, Date of Birth and Community (BC, SC, ST, OC) and whether Physically Handicapped (PH). Based on the details of community and other details, system will indicate the fee applicable. The candidates have to pay the indicated fee and obtain a receipt with JOURNAL NUMBER printed on it. The applicant has to provide details of JOURNAL NUMBER given on the payment receipt to access the application form. The candidate has to fill all the relevant details and upload "scanned copy of passport photo with signature below the photo" and submit into the system. On successful submission, system will alert the applicant to download pdf document containing the details submitted by the applicant with unique application number (Reference ID) as acknowledgement. The last date for payment of "Registration Fee" is 23.59 Hrs of 04.04.2017 and submission of filled in application is 23.59 Hrs of 05.04.2017.

**7. Selection Procedure:**

**A.** Written test will be conducted in the following manner.

Section A : Questions on core academic curriculum of respective discipline. **The syllabus for the examination is shown in the Annexure.**

Section B : Questions on analytical aptitude.

**B.** The minimum qualifying marks in the written test shall be for OCs - 40%, BCs - 35%, SCs, STs and Physically challenged - 30%.

**N.B.** Mere securing minimum qualifying marks does not vest any right to a candidate for selection to the post of Trainee Assistant Engineer.

**C.** Only those candidates who qualify in the written examination by being ranked high, community wise will be selected provisionally as per rules in vogue.

**D.** The candidates will be selected and allotted to Zones/Generating Stations as per their Rank in the merit list and as per zonal preferences for allotment of non-local candidates against vacancies available. Selection shall be made on State Wide merit, in respect of non-local candidates and allotment to Zones shall be made as per the **preference** given by candidate in his/her online application, against the actual vacancies.

The said preferences are only indicative for being considered to the extent possible but not binding. Therefore, the APGENCO has the power to assign a successful candidate to any notified post in the Zone in respect of non-local candidates, for which, he/she is considered to be qualified and eligible, subject to fulfilling the selection criteria. Mere claim of preference for any zone for allotment against vacancy does not confer any right to selection for that Zone in particular or any Zone in general.

**E.** Candidates have to produce Original documents viz.Date of Birth Certificate, Educational Qualification certificate/s, community certificate, physical disability certificate (disability not < 40% for PH,VH and > 75% for HH) issued by the concerned competent Medical Board, if any, study/residence certificate and other particulars for verification as and when required and called for. **If the particulars furnished in the Online Application Form do not tally with the Original documents produced by the Candidates, his/her candidature will be rejected.**

**F.** The persons already in Government Service/autonomous bodies/other Corporations etc., whether in permanent or temporary capacity or as work charged employees must take print out of the application after properly filled and get it endorsed by his/her employer and keep it with him/her ready, so as to, submit the same as and when called for.

**G.** The appointment of selected candidates will be subject to their being found medically fit in the appropriate medical classification.

**8. Reservation to Local Candidates:**

Reservation to the local candidates is applicable as provided in the Rules and as Amended from time to time in force as on the date of notification. The candidates claiming reservation as Local candidates should obtain the required study certificates (from Class IV to X) or Residence Certificate in the proforma only for those candidates who have not studied in any Educational Institutions as the case may be. The relevant certificates may be got ready with authorized signature and kept with the candidates for verification as and when required.

**Definition of Local Candidate:**

(i) "Local Candidate" means a candidate for direct recruitment to any post in relation to that Local areas where he/she has studied in Educational Institution(s) for not less than four consecutive academic years prior to and including the year in which he/she appeared for S.S.C. or its equivalent examination. If however, he/she has not studied in any Educational Institution during the above four years period, it is enough if he/she has resided in that area, which is, claimed as his/her Local area during the above said period.

(ii) In case the candidate does not fall within the scope of the (i) above, it will be considered if he/she has studied for a period of not less than seven years prior to and inclusive of the year in which he/she has studied for the maximum period out of the said period of seven years AND where the period of his/her study in two or more local areas are equal, such local area where he/she has studied last (in such Local area) will be taken for determining the Local candidature. Similarly, if he/she has not studied during the above said period in any Educational Institution(s), the place of residence during the above period will be taken into consideration and Local candidature determined with reference to the maximum period of residence or in the case of equal period where he/she has resided last.

(iii) In cases where visually handicapped and hearing impaired persons, studied in the special schools meant for them, the native place of parents of such visually handicapped and hearing impaired persons will be the local area.

(iv) If the claim of Local candidature is based on study, the candidate is required to produce a certificate from the Educational Institution(s) where he/she has studied during the said 4/7 years period. If however, it is based on residence, a certificate should be obtained from an officer of the Revenue Department not below the rank of a Tahsildar, an independent charge of a Mandal.

(v) If, however, a candidate has resided in more than one Mandal during the relevant 4/7 years period but within the same District or Zone as the case may be, separate certificates from the Tahsildhars exercising jurisdiction have to be obtained in respect of different areas.

(vi) In terms of G.O.Ms.No.132 (General Administration (SPF&MC) Department) Dated:13.06.2016, candidates who migrate to any part of the State of Andhra Pradesh from the State of Telangana within a period of three years from the 2nd day of June, 2014 shall be regarded as the local candidate in the State of Andhra Pradesh at the place of his residence and be treated at par with the local candidates residing in that area, for the purpose of employment. To this effect, candidates who migrated from Telangana to Andhra Pradesh as per terms laid out in circular memo No.4136/SPF & MC/2015-5, Dated:08.08.2016 of Government of Andhra Pradesh shall obtain the **Migration Certificate** and produce at the time of the verification.

**To Note:**

A. Single certificate, whether of study or residence or Migration Certificate would suffice for enabling the candidate to apply as a "Local Candidate".

**B.** Resident certificate will not be accepted, if a candidate has studied in any Educational Institution up to S.S.C. or equivalent examination, such candidates **have to produce study certificates invariably.**

C. Each of the following Zones comprises the Districts mentioned against each zone.

| Zones | Districts | Generating Stations |
|---|---|---|
| 1 | Srikakulam, Vizianagaram & Visakhapatnam | Upper Sileru Hydro Electric Scheme, Machkund Hydro Electric Scheme |
| 2 | East Godavari, west Godavari & Krishna | Lower Sileru Hydro Electric Scheme, Donkarai Dam Canal Power House, Chettipet Mini Hydel Stations, Dr.NTTPS & Polavaram Hydro Electric Scheme |
| 3 | Guntur, Prakasam & Nellore | Nagarjunasagar Right Canal Power House, Nagarjuna Sagar Tail Pond Dam |
| 4 | Chitoor, Cuddapah, Anantapur & Kurnool | RTPP, PABRHES, Srisailam Right Bank Power House & Tungabhadra Hydro Electric Scheme |

**9. How to apply :** The candidate has to apply online through **APPLY ONLINE** link at http://www.apgenco.gov.in or directly through http://apgenco.cgg.gov.in link after carefully going through the detailed notification and instructions mentioned therein.

**10. Training:**

Selected candidates shall undergo training for a period of one year. At the time of joining training, they shall have to deposit their original certificates, such as, Date of Birth (SSC), Degree, Caste and Study/Residence/Migration Certificates etc. During the training period they will be paid initial scale of pay of Assistant Engineer with usual allowances admissible at the place of training.

**11. Execution of Service Bond:**

a. At the time of joining Training, the candidates shall have to execute a Bond to serve the APGENCO for a minimum period of 5 years thereafter.

b. The candidate who leaves the Corporation during the training period shall refund to the Corporation, the emoluments received by him/her + Rs.50,000/- (Rupees Fifty thousand only) by way of liquidated damages.

c. The candidate who leaves the Corporation service without serving a minimum period of 5 years after completion of training shall pay to the Corporation a sum of Rs.1,00,000/- (Rupees One Lakh only) by way of liquidated damages.

**12. Seniority:**

An integrated list of approved candidates shall be drawn based on 'the approved lists drawn for selection of Assistant Engineer (Electrical, Mechanical & Electronics)', duly merging them in the order of merit of percentile marks branch-wise by adopting the formulae of percentile system n-1/n*100 (used for deriving percentile of each selected candidate). Based on the percentile marks so obtained, the selected candidates for Electrical, Mechanical and Electronics branches will be integrated and fitted into the roster duly protecting the relative merit in each community, so as to have a common cadre of Assistant Engineer. The order in the roster shall be the seniority of the candidate to consider them for next promotion.

**13.** The candidate will be governed by the rules and regulations applicable or as framed by the APGENCO and as amended from time to time. The Tripartite Agreement entered into between the APSEB, Govt. of A.P. and the Employees Associations is not applicable to these candidates and they shall at no stage be entitled to claim any right what so ever arising out of the said Tripartite Agreement.

**14.** The written examination will be held at Vijayawada only.

**15. Instructions to the candidate:**

- The candidate must note that his /her admission to the examination is strictly provisional. The mere fact that the admission has been issued to him/her does not imply that his/her candidature has been finally cleared by the Corporation or that the entries made by the candidate in his/her Application have been accepted by the Corporation as true and correct.

- The candidates are expected to behave in orderly and disciplined manner while writing the examination. If any candidate takes away Answer Sheet, the candidature will be rejected and in case of impersonation/disorder/misbehavior during written examination, necessary F.I.R for this incident will be lodged with concerned Police Station, apart from disqualifying appointment in future.

- **Merit is only criteria that decide the selection. Candidates trying to use unfair means shall be disqualified from the selection. No correspondence what so ever will be entertained from the candidate. The candidature and conditions specified here are subject to latest rules/orders come into force during the process of recruitment.**

**16. Debarment:**

i. Candidates should make sure of their eligibility to the post 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 declarations regarding his/her eligibility at any stage or suppressing any information is liable to be debarred from appearing for any examinations conducted by the Corporation and summarily rejection of their candidature for this recruitment.

ii. Any candidate is or has been found impersonating or procuring impersonation by any 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 candidates may in addition to rendering himself/herself liable for Criminal Prosecution, will also be liable to be debarred permanently.

iii. Corporation's decision to be final. The decision of the Corporation 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 shall be final in all respects and binding on all concerned. The Corporation also reserves its rights to alter and modify regarding time and conditions laid down in the notification for conducting the various stages up to selection duly intimating details thereof to all concerned, as warranted by any unforeseen circumstance arising during the course of this process, or as deemed necessary by the Corporation at any stage.

17. The employees working in APGENCO in the cadre of Assistant Engineer and above are not eligible to apply; if found, they are liable for disciplinary action apart from Prosecution.

18. Candidates shall appear for written test at their own cost.

**K VIJAYANAND**
**MANAGING DIRECTOR**

**ANNEXURE**
**Syllabus**
**(for Electrical Branch/AE)**

**1. Electrical Circuits and Networks:**

Kirchoff's laws, mesh and node analysis, network theorems, sinusoidal steady state analysis of single phase and three phase circuits, resonance, transient response of RL, RC,RLC circuits for different inputs, to-port networks, Two element network synthesis.

**2. Control Systems:**

Modeling of physical systems, Block diagrams and signal flow graphs, Time and frequency domain analysis, Steady state errors, Routh's criterion, Nyquist and Bode plots, compensation, root loci, elementary ideas of state variable analysis, control systems components.

**3. Measurements and Instrumentation:**

SI units, measurement of current, voltage, power, power-factor and energy. Measurement of resistance, inductance capacitance and frequency-bridge methods, transducers and their applications to the measurement of non-electrical quantities like temperature, pressure, strain, displacement etc., cathode ray oscilloscope.

**4. Analog and Digital Electronics:**

Characteristics of diodes, BJT, FET,SCR, Amplifier biasing, equivalent circuits, frequency response, feedback amplifiers, power amplifiers, oscillators, operational amplifiers and applications, wave shaping circuits, multi-vibrators, flip-flops, universal gate combinational circuits, A/D and D/A converters.

**5. Electrical Machines and power Electronic Drives:**

Single phase transformer, equivalent circuit, tests, regulation and efficiency, three phase transformer connections parallel operation, auto transformer, principle of energy conversion, winding of rotating machines, DC generators and motors, characteristics, starting and speed control, three phase induction motors performance characteristics, starting and speed control, single phase induction motors, synchronous generators, performance, regulation, parallel operation, synchronous motors, starting characteristics and applications, synchronous condensers, fractional horse power motors, permanent magnet and stepper motors, Characteristics of Power Electronic devices, phase control, bridge converters, choppers and inverters, basic concepts of adjustable speed drives.

**6. Power Systems:**

Electrical power generation thermal, hydro, nuclear : transmission line parameters; steady state performance of overhead transmission lines and cables, surge propagation, distribution systems, insulators, bundle conductors, corona, and radio interference effects; per-unit quantities: bus admittance and impedance matrices: load flow: voltage control and power factor correction; economic operation, symmetrical components, analysis of symmetrical and unsymmetrical faults; principles of over current, differential and distance protections, circuit breaker, concept of system stability, swing curves and equal area criterion.

**Syllabus**
**(for Mechanical branch/AE)**

## 1. Strength of Materials:

Simple stresses and strains Hooke's law, elastic constants, stress strain curve of mild steel bars of uniform strength, compound bars, temperature stresses, stresses on oblique planes – principal stresses and strains, Mohr's stress circle, shear force and bending moment diagrams for beams, bending and shear stresses in beams, deflections of beams, columns and struts, strain energy, torsion of circular shafts and springs.

## 2. Fluid Mechanics and Machinery:

Basic fluid properties, fluid static – pressure measurements, buoyancy and flotation, fluid kinematics, fluid dynamics – Euler's Bernoulli's and Impulse momentum equations, laminar and turbulent flows, flow through pipes and losses in pipes, bends, boundary layer theory, compressible fluid flow, impact of jets, Hydraulic turbines and pumps, Ram, Accumulator and intensifier.

## 3. Material science and metallurgy:

Structure and properties of engineering materials, bonding in solids, imperfections in crystals and metals, structure of alloys, manufacture of iron and steel, heat treatment, alloy steels, principles of powder metallurgy.

## 4. Theory of Machines:

Displacement, velocity and acceleration analysis of plane mechanisms, dynamic analysis of slider – crank mechanism, gear trains, flywheels.

## 5. Vibrations:

Free and forced vibrations, effect of damping, resonance, vibration isolation, critical speeds of shafts.

## 6. Design of Machine elements:

Design for static and dynamic loading failure theories, fatigue strength, S-N diagram, design of joints, shafts, bearings, gears, brakes, clutches, screws, springs, cranks, piston, gyroscopes, balancing and governors.

## 7. Heat Transfer:

Various modes of heat transfer, fins, heat exchangers, LMTD & NTU methods, unsteady state heat conduction, dimensionless parameters, free and forced convective heat transfer, thermal boundary layer, heat transfer in flow-over flat plates and through pipes, effect of turbulence, radiative heat transfer, shape factors, network analysis, condensation and boiling.

## 8. Thermodynamics:

Zeroth, first and second laws of thermodynamics, thermodynamics systems and processes, Carnot cycle, Air-standard cycles, irreversibility and availability, properties of pure substances, psychometry, Refrigeration and Air conditioning, working principles and their applications.

## 9. Applied Thermodynamics:

classification of compressors and its working principles, Classification of I.C. Engines and its working principles, performances, Design considerations of combustion chambers for C.I. & S.L Engines, knocking, rating of fuels, lubrications, Ignition systems.

## 10. Turbo Machines:

Working principles of gas turbines, steam turbines, Rankine's cycle. Modified Rankine's cycle, jet propulsion and nozzles.

## 11. Metal cutting and machine tools:

Mechanics of machining, single and multi point cutting tools, tool geometry , tool life wear, cutting force analysis, micro finishing machines – EDM, ECM and USM, NC machines, jigs and fixtures. Standards of measurements, limits, fits, tolerances, linear and angular measurements, comparators, lathes, drilling, shaping, planning, milling, gear cutting. Broaching and grinding machines.

## 12. Foundry, Welding and Forging:

Design of patterns moulds and cores, solidification, design consideration of runner, riser and gate. Physics of welding, types of welding and their principles, brazing, soldering, adhesive bonding, Fundamental of hot and cold working processes, forging, rolling, extrusion, drawing, shearing and bending.

## 13. Production and operation management:

Plant layout, material handling, production planning and control, materials, management and work studies, inspections, quality control, cost analysis, operation research, basic concepts of CAD/CAM, inventory control.

**Syllabus**
**(for Electronics branch/AE)**

## 1. Basics of Circuits and Measurement Systems:

Kirchoff's laws, mesh and nodal Analysis, Circuit theorems. One-port and two-port Network Function. Static and dynamic characteristics of Measurement Systems. Error and uncertainty analysis. Statistical analysis of data and curve fitting.

## 2. Transducers, Mechanical Measurement and Industrial Instrumentation:

Resistive, Capacitive, Inductive and piezoelectric transducers and their signal conditioning. Measurement of displacement, velocity and acceleration (translational and rotational), force, torque, vibration and shock. Measurement of pressure, flow, temperature and liquid level. Measurement of pH, conductivity, viscosity and humidity.

## 3. Analog Electronics:

Characteristics of diode, BJT, JFET and MOSFET. Diode circuits. Transistors at low and high frequencies, Amplifiers, single and multi-stage. Feedback amplifiers. Operational amplifiers, characteristics and circuit configurations, Instrumentation amplifier. Precision rectifier. V-to-I and I-to-V converter. Op-Amp based active filters. Oscillators and signal generators.

## 4. Digital Electronics:

Combinational logic circuits, minimization of Boolean functions. IC families, TTL, MOS and CMOS. Arithmetic circuits, Comparators, Schmitt trigger, timers and mono-stable multi vibrator. Sequential circuits, flip-flops, counters , shift registers, Multiplexer, S/H circuit, Analog-to-Digital and Digital-to-Analog converters. Basics of number system. Microprocessor applications, memory and input-output interfacing. Microcontrollers.

## 5. Signals, Systems and Communications:

Periodic and aperiodic signals. Impulse response, transfer function and frequency response of first and second order systems. Convolution, correlation and characteristics of linear time invariant systems. Discrete time system, impulse and frequency response. Pulse transfer function. IIR and FIR filters. Amplitude and frequency modulation and demodulation. Sampling theorem, pulse code modulation. Frequency and time division multiplexing. Amplitude shift keying, frequency shift keying and pulse shift keying for digital modulation.

## 6. Electrical and Electronic Measurements:

Bridges and potentiometers, measurement of R, L and C. Measurements of voltage, current, power, power factor and energy. A.C & D.C current probes. Extension of instrument ranges. Q-meter and waveform analyzer. Digital voltmeter and multi-meter. Time, phase and frequency measurements. Cathode ray oscilloscope. Serial and parallel communication. Shielding and grounding.

## 7. 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 derivative controller, Fuzzy controllers.

## 8. Analytical, Optical 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, applications in metrology. Basics of fiber optics.

**Syllabus**
**(for Civill branch/AE)**

## 1. Strength of materials and theory of structures:

Simple stresses and strains, Hooke's Law, elastic constants, stress strain curve of mild steel stresses on oblique planes – Principal stresses and strains, Mohr's stress circle, temperature stresses, compound bars, shear force and bending moment diagrams for beams, bending and shear stresses in beams, strain energy principles, torsion of circular shafts – Pure torsion and combined with bending and thrust, deflections of simple beams, thin and thick cylinders, columns and struts, direct and bending stresses, trusses, propped cantilevers and fixed beams, arches, cables and suspension bridges; moving loads and influence lines; static and kinematic indeterminacies, Continuous beams and portal frames-movement distribution, Kani's and matrix methods. Unsymmetrical Bending and shear Centre.

## 2. Reinforced Concrete:

Materials – properties, grades and tests, workability and mix design of concrete – basic concepts of working stress and limit state methods of design – Limit state design of beams, slabs, columns, footings. Circular and flat slabs, water tanks, bridges – IRC specifications and loadings, Slabs and T – beam bridges, retaining walls, Pre-stressed concrete – basic concepts, losses and analysis and design of beams including end block.

## 3. Steel structure:

Rivetted and welded joints, Connections – eccentric and framed, simple and compound beams, tension and compression members, plate and gantry girders, roof trusses, plate girder and truss bridges, water tanks, roof trusses, tubular sections and design, transmission towers, column bases, plastic analysis, basic principles, theorems, methods of analysis, analysis and design of determinate and indeterminate beams and frames.

## 4. Geo-Technical Engineering:

Origin and classification of soils, three phase system, basic definitions and relations, effective stress. Permeability, capillarity and seepage of soils, flownets, flow through earthen dams, compressibility, consolidation and compaction of soils, shear strength, stability of slopes, earth pressures and retaining walls, stress distribution in soils, settlement analysis, subsurface exploration and site investigations, bearing capacity of soils, shallow and deep foundations, pile foundations.

## 5. Other Topics:

Elements of surveying – Chain, plane table, compass and theodolite, leveling, building materials and construction, formwork, CPM and PERT.

## 6. Fluid Mechanics and Machinery:

Properties of fluids, pressure measurement fluid statics, buoyancy and flotation, fluid kinematics and fluid dynamics, orifices and mouthpieces, notches and weirs, laminar and turbulent flows, flow through pipes, forces on immersed bodies, flow in open channels, impact of jets, Hydraulic turbines and pumps, dams, power houses, hydrology and hydro power plants.