



## ODISHA PUBLIC SERVICE COMMISSION

ADVERTISEMENT NO.15 OF 2023-24.

**Recruitment to the posts of Inspector of Motor Vehicle/ Additional R.T.O. (Enforcement)/ Assistant Works Engineer in Group-A of OTES under Commerce and Transport (Transport) Department**

**WEBSITE – <http://opsc.gov.in>**

Online applications are invited from the prospective candidates through the Proforma Application Form to be made available in the WEBSITE (<http://opsc.gov.in>). The link for online application and submission shall be available from **22.08.2023 to 22.09.2023 (Note-22.09.2023 is the last date for submission of Registered Online Application)** for recruitment to **08(03-w)** posts of Inspector of Motor Vehicle/ Additional R.T.O. (Enforcement)/ Assistant Works Engineer in Group-A of Odisha Transport Engineering Service under Commerce and Transport (Transport) Department in the scale of pay Rs. 56,100/- in Level-12, Cell-1 of the pay matrix under ORSP Rules, 2017 with usual Dearness and other Allowances as may be sanctioned by the Government from time to time. The Examination will be conducted in accordance with the provisions of the Odisha Transport Engineering Service (Method of Recruitment and Conditions of Service) Rules, 2021 as amended from time to time.

### **2. VACANCY POSITION:**

As per requisition submitted by Commerce and Transport (Transport) Department, Government of Odisha, the category wise vacancy position along with reservation thereof is given below:

Sl. No.	Category	No. of Post
1	UR	02(01-w)
2	SC	03(01-w)
3	SEBC	03(01-w)
TOTAL		<b>08(03-w)</b>

### **Note:**

- In the event of non-availability of sufficient number of eligible women candidate(s) belonging to any category, the vacancies/ remaining vacancies of that category shall be filled up by eligible & suitable male candidate(s) of the same category.
- The number of vacancies to be filled up on the basis of this recruitment is subject to change by the Government without notice, depending upon the exigencies of public service at the discretion of the State Government.

**3. AGE LIMITS:**

A candidate must have attained the age of 21 years and must not be above the age of 38 years as on the **1<sup>st</sup> January, 2023**, i.e. he/she must have been born not earlier than **2<sup>nd</sup> January, 1985** and not later than **1<sup>st</sup> January, 2002**.

The upper age limit is relaxable by 05 (five) years for candidates belonging to S.C./S.E.B.C./ Women and Ex-Servicemen.

Provided that, a candidate who comes under more than one category mentioned above, he/she will be eligible for one age relaxation benefit only, which shall be considered most beneficial to him/her.

SAVE AS PROVIDED ABOVE THE AGE LIMITS PRESCRIBED CAN IN NO CASE BE RELAXED.

Date of birth entered in the High School Certificate or equivalent Certificate issued by the concerned Board/Council will be accepted by the Commission.

**NOTE: - Candidates should also note that once a Date of Birth has been claimed by them and entered in the records of the Commission for the purpose of admission to an examination, no modification will be allowed subsequently on any grounds whatsoever. If, on verification at subsequent stage, any variation is found in their date of birth from the date of birth entered in their High School Certificate or equivalent certificate, the candidature of the candidate concerned, shall be rejected and or she/he may be debarred from present and future recruitment/examination.**

**4. EDUCATIONAL QUALIFICATION:**

(a) A candidate **must hold a Degree** in

(i) Automobile Engineering.

or

(ii) Mechanical Engineering with Automobile Engineering as a subject

or

(iii) Any other subject or discipline from a recognized University as may be declared by the Government to be equivalent to the degree as specified in Clause (i) and (ii) above.

(b) Possess a license to drive a Transport Vehicle.

Provided that candidates not possessing a valid driving license for Transport Vehicle, shall undergo driving training of Transport Vehicle in a recognized Heavy Motor Vehicle Driving Training School **during the probation period** and obtain the driving license, the failing which his service shall be liable to be terminated.

(c) have knowledge in Computer application.

**5. EXAMINATION FEE:**

The examination fee for all categories of candidates has been exempted as per **GA & PG Department Notification No. 9897/Gen, Dt-11.04.2022**.

6. **METHOD OF SELECTION:**

The selection of candidates for recruitment to the posts of Inspector of Motor Vehicle/ Additional R.T.O. (Enforcement)/ Assistant Works Engineer shall consist of the following stages.

- (i) Written Examination – 150 marks
  - (ii) Computer Skill Test – 50 marks
  - (iii) Viva Voce Test/Interview – 20 marks
- The Written Examination shall be of Objective type/Multiple Choice Question (MCQ) pattern and shall carry 150 marks with a duration of three (03) hours.
  - There shall be **negative marking** at the rate of **twenty five percent (25%)** assigned to a correct answer for every wrong response.
  - The candidates who qualify in the written examination will be called for the Skill test in Computer.
  - The qualifying marks for the Written examination shall be **50% for UR & SEBC and 45% for SC categories.**
  - The Skill test in Computer shall be **qualifying** in nature.
  - The qualifying mark for the Skill test shall be forty percent (40%) of the total marks.
  - The candidates who qualify in the Skill test will be called for Viva-Voce test/Interview.
  - The Viva-voce test/ Interview shall consist of 20 marks.
  - After completion of all the test, the Commission shall prepare a panel of names containing selected candidates equal to the number of vacancies advertised in order of merit, on the basis of the total marks secured in the Written examination and Viva-voce test/Interview.

The Plan of examination and broad outline of the Syllabi for the said examination are annexed at **Appendix-I.**

**Note- Any details relating to this recruitment like cut-off marks, answer keys, individual marks etc. shall only be declared on the website of the Commission after publication of the final results and select list.**

7. **PLACE OF EXAMINATION:**

The Written Examination will be held at **Cuttack.** Request for change of Examination Centre shall not be entertained.

**8. OTHER ELIGIBILITY CONDITIONS:**

- (i) The candidate must be a citizen of India;
- (ii) He/she must be able to read, write and speak Odia and have-
  - (a) Passed Middle School Examination with Odia language as a subject:  
or
  - (b) Passed Matriculation or Equivalent examination with Odia as medium of examination in non-language subject;  
Or
  - (c) Passed in Odia as language subject in the final examination of Class VII or above from a school or educational institution recognized by the Government of Odisha or the Central Government:  
or
  - (d) Passed a test in Odia in Middle English School Standard conducted by the School & Mass Education Department.
- (iii) A candidate, who has more than one spouse living or in case of a woman candidate, if married to a person having one spouse living, shall not be eligible for appearing at the examination, unless the State Government has exempted his/her case from operation of this limitation for any good and sufficient reasons.
- (iv) Government Servants, whether temporary or permanent, are eligible to apply provided that they possess the requisite qualifications and are within the prescribed age limit as provided under Para-3 & 4 of the Advertisement. **They must inform their respective Heads of Departments in writing regarding submission of their application for this recruitment and obtain "No Objection Certificate"**.
- (v) If a candidate has, at any time, been debarred for a certain period/chance(s) by the Odisha Public Service Commission or other State Public Service Commission or U.P.S.C. from appearing at any Examination/Interview, he/she **will not be eligible** for such recruitment for that specified period/chance(s).
- (vi) **Only those candidates, who possess the requisite qualification and fulfil other eligibility conditions by the closing date of submission of online applications will be considered eligible.**
- (vii) The Period of Probation will be applicable as prescribed in the recruitment rule.
- (viii) A candidate must have good moral character. Also, he/she must be of good mental condition and bodily healthy and free from any physical defect likely to interfere with the discharge of his/her duties as an officer of the Service/Post. A candidate, who, after such medical examination, as the Government may prescribe, is not found to satisfy these requirements, will not be appointed to the service.
- (ix) A candidate who claims change in his/her name after having passed the High School Certificate Examination or equivalent examination, is required to furnish copy of publication of the changed name in local leading daily newspaper as well as copy of notification in the Gazette in support of his/her change of name.

- (x) Every candidate selected for appointment shall be examined by the Medical Board. A candidate, who fails to satisfy the Medical Board, shall not be appointed.

**9. IMPORTANT POINTS:**

- (I) A candidate found guilty of seeking support for his/her candidature by offering illegal gratification or applying pressure on any person connected with the conduct of the recruitment process or found indulging in any type of malpractice in course of the selection or otherwise, shall, in addition to rendering himself/herself liable to criminal prosecution, be disqualified not only for the recruitment for which she/he is a candidate, but also may be debarred, either permanently or for a specified period, from any recruitment or selection to be conducted by the Commission.
- (II) The provisions of the Odisha Conduct of Examinations Act, 1988 (Odisha Act-2 of 1988) are applicable to this Examination conducted by the Odisha Public Service Commission. Any violation of the above Act and violation of "**Instructions to candidates**" (as provided in the advertisement, application form, Admission Certificate & Answer Script etc.) will be seriously viewed and disciplinary action will be taken against the concerned candidates as deemed proper.
- (III) **Online applications submitted to OPSC, if found to be incomplete in any respect, are liable to rejection without entertaining any correspondence with the applicants on that score.**
- (IV) **Admission to the Written Examination/Skill Test/Viva Voce Test will be provisional. If on verification at any stage before or after the examination/interview, it is found that a candidate does not fulfil all the eligibility conditions, his/her candidature will be liable to rejection. Decision of the Commission regarding eligibility or otherwise of candidate shall be final.**
- (V) This advertisement should not be construed as binding on the Government to make appointment.
- (VI) The duty is technical in nature. Enforcement of provisions under M.V. Act/ Rules, Inspections of Vehicles and as prescribed by Government from time to time.
- (VII) All persons appointed under the Government of Odisha on or after 1st January, 2005 shall not be eligible for pension as defined under sub-rule (1) of Rule-3 of the Odisha Civil Services (Pension) Rules, 1992; but shall be covered by the defined Contributory Pension Scheme in accordance with the Odisha Civil Services (Pension) Amendment Rules, 2005.
- (VIII) **Any misrepresentation or suppression of information by the candidate in the online application, will result in cancellation of his/her candidature or penalty, as decided by the Commission be imposed on the candidate.**
- (IX) Mere empanelment in the select list shall not confer any right for appointment unless the Government is satisfied after making such enquiry as may be deemed necessary that the candidate is suitable in all respects for appointment to the Service.

- (X) **Community (caste status) once mentioned by the candidates under the appropriate box of the online application form, will be treated as final and the same shall not be changed subsequently under any circumstances.**
- (XI) Candidates are required to bring the copies of certificates and other requisite documents as stated under Para-10 of this advertisement at the time of document verification.
- (XII) **No request for withdrawal of candidature and change of category will be entertained under any circumstances.**

**10. CERTIFICATES/DOCUMENTS TO BE ATTACHED:**

Candidates who qualify in the Written examination, Skill test and provisionally called for document verification should be in readiness to submit the Hard copy of Online Application Form, along with true copies of the following documents duly self-certified. The candidates are required to mention on each document **“submitted by me”** and put their full signature & date on the same. They must not attach the original certificates with their hard copy of online Applications. Only those who are called for the Personality Test or Interview will be required to bring with them the original certificates on the day of verification as decided by the Commission, **failing which he/she shall not be allowed to appear at the Personality Test or Interview. A notice to this effect will be issued later.**

**If a candidate fails to produce any of the original certificates and documents in respect of self-attested photocopies submitted with the application during verification, his/her candidature will be rejected.**

- (a) H.S.C. or equivalent certificate in support of declaration of age issued by the concerned Board/Council;
- (b) B. Tech./ B.E. Degree Certificate or any qualification declared by the Government as equivalent thereto issued by a recognized University;
- (c) Mark-lists of all semesters / annual examination in support of all the aforesaid examinations passed (H.S.C. to B. Tech./ B.E. Degree) including fail marks, if any, issued by the concerned Board/Council/University.

**NOTE-1: (i)** Candidates who have not been awarded percentage of marks, but only "GRADE MARKS", should, along with their applications, produce the Conversion Certificate from the concerned University indicating the actual equivalent percentage of marks and the conversion formula, failing which, their applications are liable to be rejected.

**(ii)** While filling up the relevant box of the online application form, the candidates have to mention the details of marks (Excepting the marks secured in the Extra-Optional /4th Optional Subject) secured in the examinations passed (HSC to award of Degree).

- (d) Caste Certificate **by birth** in support of claim as S.C./S.E.B.C., wherever applicable (Please see Note-2-Para-10).
- (e) Required Odia Test Pass Certificate from the competent authority, wherever applicable (Please see Para-8 (ii) & Note-3-Para-10).
- (f) Discharge Certificate issued by the Commanding Officer of the Unit last served; Ex-servicemen candidates must submit an Affidavit that he has not been appointed against any civil post after retirement from Military Service, wherever applicable.
- (g) If a candidate claims to possess qualification, equivalent to the prescribed qualification, the rule/authority (with number & date) under which it is so treated, must be furnished with the hard copy of the online Application.
- (h) Four recent passport size photographs (unsigned & unattested) which has been uploaded with online application form.
- (i) **No Objection Certificate** from their competent authorities in case of Government Servants.
- (j) Valid Heavy Driving Licence for Transport Vehicle.
- (k) Any proof of Identity.

**NOTE-2:** Candidates claiming to be belonging to S.E.B.Cs. or S.Cs. category **by birth** are required to submit copy of the relevant Caste Certificate as mentioned in their online application form & issued by the competent authority in the prescribed form. Candidates of SEBC category (other than Creamy Layer) must submit copy of Caste Certificate issued by the competent authority within the last three years by the closing date for submission of online application form in the prescribed form. The SEBC certificate which is more than three years old by the closing date of submission of online application form is liable for rejection.

(i) Women candidates belonging to S.C./S.E.B.C. categories are required to submit Caste Certificates by birth showing "daughter of .....". Caste Certificates by virtue of marriage (i.e. showing "wife of .....") are not acceptable and liable for rejection.

(ii) **OBC Certificates will not be accepted in lieu of SEBC Certificates AND CANDIDATES SUBMITTING OBC CERTIFICATE ARE LIABLE FOR REJECTION.**

**NOTE-3:** Degree Certificate, Caste Certificate, Odia Test Pass Certificate & Discharge Certificate of Ex-servicemen must have been issued by the competent authority within the last date fixed for submission of online application forms.

**11. GROUND OF REJECTION OF APPLICATIONS: -**

Applications of candidates will be **rejected** on any of the following grounds-

- (a) Incomplete online application form.
- (b) Declaration not signed (full signature) by the candidate in the hard copy of online application form.
- (c) Age limit of candidate not coming under para-3 of the Advertisement.
- (d) No required educational qualification as provided under Para-4 of the Advertisement.
- (e) Not furnishing copies of Certificates/documents etc. as provided under Para-10 of the Advertisement.
- (f) Odia Test (ME standard) not passed/Odia Test pass evidence not furnished, as required under Para-8 (ii) of the Advertisement.
- (g) Submission of wrong information/false information about qualification/age/Odia Test Pass evidence/category status (SC/SEBC/ Ex-servicemen/Women etc).
- (h) Suppression of facts/information about eligibility, if any.
- (i) Any other grounds as per the decision of the Commission.

**N.B.: Application/candidature of a candidate shall be rejected at any stage of recruitment process when discrepancy is noticed/detected.**

**12. HOW TO APPLY:**

- (a) **Candidate must go through the details of this Advertisement available in the Website of OPSC before filling up online application form.**
- (b) Candidates must apply online through the Website of the OPSC **<http://opsc.gov.in>. Applications received through any other mode would not be accepted and summarily be rejected.**
- (c) The online application form is automated and system driven and will guide the candidate seamlessly in filling the application. The requisite options shall be enabled and information shall be asked as per data furnished by the candidate. Before filling up the information, ensure that accurate information is fed, for edit option is limited & on confirmation there is no scope for further edit even if wrongful entry has been made while filling up application. **No further representation from the candidate shall be entertained on that score.**
- (d) Candidates are requested to upload the scanned image of latest passport size photograph along with scanned image of their full signature and scanned image of Left-Hand Thumb Impression (LTI) in the online Application Form.



Uploaded photograph, Specimen (full) signature and LTI must be clearly identifiable/ visible, otherwise the application of the candidate is liable to be rejected by the Commission and **no representation from the candidate will be entertained.**

- (e) Candidates should keep at least three copies of latest passport size photograph which is uploaded in the online application form for future use.
- (f) *On successful submission of the online application form, a unique "Permanent Public Service Account Number (PPSAN)" will be assigned to the applicant. Candidates are required to take a print out of the finally submitted online Registration/ Re-registration and finally submitted online application forms and put his/her signature under the declaration for submission to OPSC along with copies of requisite certificate & documents as and when asked.*
- (g) **The candidates are advised to submit the Online Application Form well in advance without waiting for the closing date to avoid last hour rush.**
- (h) Admission Certificate to the Written Examination & Computer Skill Test to the eligible candidates of Inspector of Motor Vehicle/ Additional R.T.O. (Enforcement)/Assistant Works Engineer will be uploaded in the Website of OPSC prior to the date of Written Examination & Computer Skill Test. The date & programme of Written Examination, Computer Skill Test and Interview will be published in the OPSC Website & in the Newspapers. The candidates are required to **download their Admission Certificate/Instruction to candidates from Website.** No separate correspondence will be made for this purpose.
- (i) Any complaint on the conduct of examination must be sent to the Grievance wing of the Commission by e-mail ([opsc@nic.in](mailto:opsc@nic.in)) within 07(Seven) days of completion of the examination.

### **13. FACILITATION COUNTER: -**

To resolve any technical Problem faced in filling up of online Registration and application forms, candidate may contact OPSC Technical Support over Telephone No. 0671-2304707 between 10.30 A.M. to 1.30 P.M. & 2.00 P.M. to 5.30 P.M. of any Odisha Government working days.

In case of any guidance/information on this advertisement and recruitment, candidates may go through the **FAQ** available in the website of the Commission or contact the O.P.S.C. Facilitation Counter over

Telephone No.0671-2304141/ 2305611 &Extn. -218 on any Odisha Government working day between 10.30 A.M. to 1.30 P.M. & 2.00 P.M. to 5.30 P.M.

The candidates are required to visit the website of the Commission at **<http://opsc.gov.in>** for detailed information about important Notices, rejection of applications, date & time of Written Examination/Computer Skill test/Interview etc. and also to keep track of publication of various Notices to the effect in the leading local daily newspapers for information.

**CLOSING DATES**

THE LINK FOR ONLINE APPLICATION AND SUBMISSION SHALL BE AVAILABLE IN THE WEBSITE FROM 22.08.2023 TO 22.09.2023. NOTE:-22.09.2023 IS THE LAST DATE FOR SUBMISSION OF REGISTERED ONLINE APPLICATION FORM)

NB: THE ONLINE APPLICATION FORM IF FOUND DEFECTIVE IN ANY RESPECT ARE LIABLE TO BE SUMMARILY REJECTED.

CUTTACK  
Dt. 17.08.2023

  
SECRETARY,  
ODISHA PUBLIC SERVICE COMMISSION,  
CUTTACK

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## Appendix-I

### **Plan of Examination, Standard and Syllabi**

#### **1. Written Examination:**

- The Written examination shall consist of the following subjects –
  - (i) Automobile Engineering
  - (ii) Mechanical Engineering

The candidate has the option to choose one of the above papers i.e. either Automobile Engineering or Mechanical Engineering. The candidate has to indicate the name of the paper which he has chosen for the written examination in prescribed box of online application.

<b>Pattern of examination</b>	<b>No. of questions</b>	<b>Total marks</b>	<b>Duration of the examination.</b>
Objective Type/ MCQ	150	150	3 hours

- The standard of papers will be that of B.Tech. Examination.
- There shall be **negative marking** at the rate of **25%** assigned to a correct answer for each wrong response.
- The qualifying marks for the Written examination shall be **50% for UR & SEBC and 45% for SC categories.**

#### **2. Computer Skill Test:**

<b>Pattern of examination</b>	<b>No. of questions</b>	<b>Total marks</b>	<b>Duration of the examination.</b>
Practical	5	50	1 hour

- The Skill test shall be qualifying in nature.
- The qualifying marks for the Computer skill test shall be 40% of total marks.
- Syllabus for the Skill test:  
Windows, MS Office (Word, Excel, Power Point), MS Access, Usage of Internet Services.

#### **3. Viva-Voce test/Interview:**

- The Viva-Voce test/Interview shall carry 20 marks.

# SYLLABUS FOR AUTOMOBILE ENGINEERING

1. **ENGINEERING MECHANICS (STATICS AND DYNAMICS)**  
Forces, Moments, Equilibrium concepts, Truss analysis, D'Alembert's principle, work, Power, Energy, Impulse and Momentum.
2. **MECHANICS OF SOLIDS**  
Principles of stress-strain, Elasticity, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads, Calculation of various factors, Axially Loaded Members Composite bars in tension and compression, Biaxial State of Stress, Thin cylinders and spheres, Mohr's circle, Principal stresses, Simple Bending of Beams, stresses and deflection in beams, BMD and SFD, Torsion in solid and hollow circular shafts, Theory of columns, Close - Coiled helical springs, Theories of failures.
3. **DESIGN OF MACHINE ELEMENTS AND COMPONENTS**  
Design of fasteners (screwed fasteners, welded joints), Fit and tolerance, Design of shafts and bearing, springs and flywheels.
4. **KINEMATICS AND DYNAMICS OF MACHINES**  
Simple mechanism, kinematics and their classifications, link mechanism. Inversion Four bar chain mechanism, Flexible power transmission system, Geometrical configuration, Gyroscope, cam profile, sound and vibrations and mechanical system Balancing Dynamic balancing, rotor balancing, etc.
5. **VEHICLE DESIGN**  
Design of different vehicle components like IC Engine Parts, clutch, gears, brakes, suspension systems, propeller shafts.
6. **VEHICLE DYNAMICS**  
Understanding of vehicle dynamics, Dynamics load in moving vehicle, Tyres, Acceleration performance of vehicle, Braking System, Suspension system, steering system, road loads, and ride.
7. **VIBRATION, NOISE AND HARSHNESS**  
Vibration and noise fundamentals, Rating and regulation of sound and noise.
8. **MATERIAL SCIENCE AND METTALURGY**  
Engineering Materials, Engineering properties of materials, Concept of plastic deformation of metals, concept of cold working and hot working, Heat treatment processes, Concept of alloy formation, types of alloys, solid solutions, factors governing solids solubility, Various types of steels, Iron-Carbon equilibrium diagram, T-T-T curves, Ceramics, Plastics and Composite Materials.
9. **BASIC MANUFACTURING PROCESS**  
Turning, Welding, Shaping, Molding, Foundry Technology, Drilling etc.
10. **PRODUCTION PROCESSES FOR AUTOMOTIVE COMPONENTS**  
Forming process, Gear manufacturing & powder metallurgy, Recent trends in manufacturing of auto components like NC, CNC & DNC, Powder injection moulding.

## **11. COMPUTER AIDED DESIGN AND COMPUTER AIDED MANUFACTURING (CAD & CAM)**

### **12. FLUID MECHANICS AND HYDRAULIC MACHINES**

Classification of fluids. Properties of fluids viscosity, Newton's laws of viscosity, surface tension, capillarity etc. Fluid Statics, Fluid Dynamics, Energy equations, Dimensional Analysis, Laminar and Turbulent Flows, Flow around submerged bodies, Pumps and Turbines (Types, Principles of working and calculations)

### **13. AUTOMOTIVE THERMODYNAMICS**

Laws of Thermodynamics, Zeroth law, First law, Second law, Concepts on enthalpy and entropy, Gas Law Boyle's law, Charles' law, Properties of steam, Perfect gas equation, Thermodynamic cycles Carnot cycle, Rankine cycle, Otto cycle, Diesel cycle, Dual cycle, Brayton cycle, Refrigeration and air conditioning, Fuels and Combustion, Air compressors, Basics of Gas dynamics and flow through nozzles.

### **14. AUTOMOTIVE ENGINES**

SI and CI engines, 2 stroke and 4 stroke engines, port and valve timing diagrams, Indicator diagrams, methods of engine cooling, Principles of lubrication, methods of lubrication systems, different lubricants and additives, different methods of fuel and air supply in SI and CI engines, Ignition systems, calculations of engine power, efficiencies, Fuel quality for SI and CI engines. SI and CI engine combustion principles, emissions from automotive engines and control, emission norms, turbocharging and supercharging.

### **15. COMBUSTION AND HEAT TRANSFER**

Thermodynamics of combustion, Combustion in premixed laminar and premixed turbulent combustion - Flame Speed - Burning Velocity - diffusion flames, Heat transfer by Conduction Convection and Radiation, Study of Radiator system, Study of Different Types of Heat Exchangers.

### **16. FLUID POWER & CONTROL**

Fluid Power, Hydraulic Pumps and Actuators, Hydraulic Valves, Servo Valves, Different hydraulic and pneumatic circuits.

### **17. AUTOMOBILE AIR CONDITIONING**

Automotive heaters - Manually controlled air conditioner - Heater system - Ford automatically controlled air conditioner and heater systems - Automatic temperature control - Air conditioning protection - Engine protection.  
Refrigeration system diagnosis - Diagnostic procedure - Ambient conditions affecting system pressures.

Evaporator care air flow through the dash re-circulating unit - Automatic temperature control - Duct system - Controlling flow - Vacuum reserve - Testing the air control and handling systems.

### **18. ALTERNATIVE FUELS IN AUTOMOBILES**

Methods to use different alternate fuels study and combustion of different alternate fuels like, LPG, CNG, bio fuels, fuel cell, hydrogen.

## **19. AUTOMOTIVE AERODYNAMICS**

Aerodynamic drag of vehicles, shape optimization of cars, wind tunnels for automotive aerodynamics.

## **20. AUTOMOTIVE CHASSIS**

Frames, front axle and steering systems, Driveline, rear axles and final drive, Suspension System and Braking System, Classification of brakes- drum and disc brakes.

## **21. AUTOMOTIVE TRANSMISSION SYSTEM**

Mechanical and hydrodynamic drives- different types of clutches, gearboxes, fluid coupling, torque converters, Automatic transmission and Application, Propeller shafts, Differentials, Universal joints Types of hydrostatic Drive and Electric Drives.

## **22. TWO AND THREE WHEELERS**

The Power Unit for two and three wheelers, Chassis and sub-systems.

## **23. AUTOMOTIVE TEST INSTRUMENTATION**

Different measurement methods and devices for weight, pressure, temperature, fluid flow, velocity speed, force, torque, power, acceleration and angular motion, air and fuel consumption -tests such as Endurance Tests – crash tests – wind tunnel tests – Brake tests, Transducers for Automotive Applications – Amplifiers- filters –data Acquisition- Indicators, Printers and displays – Signal Analyzing, Performance, emission, combustion, noise and vibration tests.

## **24. SENSORS AND TRANSDUCERS**

Elements of a general measurement system, Sensing elements, Signal Conditioning Elements, Transducers for Automotive Applications – Amplifiers- filters –data Acquisition- Indicators, Printers and displays –Signal Analyzing.

## **25. MICROPROCESSORS FOR AUTOMOBILES**

## **26. VEHICLE BODY ENGINEERING**

Car body details, Vehicle aerodynamics, Bus body details, Commercial vehicle details, Body materials, Trim and mechanisms.

## **27. AUTOMOTIVE ELECTRICAL AND ELECTRONICS** Batteries, D.C. Motors, Pumps, Regulations, Switches, Electrical circuits, Transformers for automotive vehicles. Sensors, Micro Processors, Transducers.

## **28. MODERN VEHICLE TECHNOLOGY**

Electric and hybrid vehicles. Solar powered vehicles, Stratified charged / lean burn engines–Hydrogen Engines–Electric vehicles, EGR, Modern fuel Injection systems – SPFI, MPFI, DI, Pilot Injection, Unit Injection, CRDI,, Digital twin spark technology, variable valve timing (VVT), Camless Engine, GDI.

## **29. VEHICLE MAINTENANCE AND MANAGEMENT**

Different service garages & its layout, Tools for servicing, Engine maintenance and servicing, Chassis maintenance and servicing, Circulatory systems and vehicle body maintenance, Vehicle maintenance record keeping.

**30. OFF ROAD VEHICLES**

Earth moving equipments, special purpose vehicles such as Shovels and Ditchers, mobile cranes, road rollers, elevators, Fork Lifters, Tractors.

**31. FLEET MANAGEMENT**

Vehicle management and operation, Vehicle parts, Supply management and budget, scheduling, Fare structure and vehicle act.

**32. AUTOMOTIVE SAFETY**

Safety concepts and equipment, Collision warning, Comfort and convenience system.

**33. ENVIRONMENTAL ENGINEERING & SAFETY**

Ecological Concepts, Air Pollution controls, Waste management, Occupational Safety and Health procedures.

# **SYLLABUS FOR MECHANICAL ENGINEERING**

## **1. ENGINEERING MECHANICS (STATICS AND DYNAMICS)**

Forces, Moments, Equilibrium concepts, Truss analysis, D'Alembert's principle, work, Power, Energy, Impulse and Momentum.

## **2. KINEMATICS AND DYNAMICS OF MACHINES**

Simple mechanism, kinematics and their classifications, link mechanism. Inversion Four bar chain mechanism, Flexible power transmission system, Geometrical configuration, Gyroscope, cam profile, vibrations and mechanical system balancing Dynamic balancing, rotor balancing, governors and flywheels.

## **3. MECHANICS OF SOLIDS**

Principles of stress-strain, Elasticity, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads, Calculation of various factors, Axially Loaded Members Composite bars in tension and compression, Biaxial State of Stress, Thin cylinders and spheres, Mohr's circle, Principal stresses, Simple Bending of Beams, stresses and deflection in beams, BMD and SFD, Torsion in solid and hollow circular shafts, Theory of columns, Close - Coiled helical springs, Theories of failure.

## **4. DESIGN OF MACHINE ELEMENTS AND COMPONENTS**

Design of fasteners (screwed fasteners, welded joints, riveted joints), Fit and tolerance, Design of shafts and bearing, springs and flywheels, Design of keys, pins and couplings, Design of levers, Design of Pressure vessels, Fatigue failure, Design of clutch and brakes. Design of hydrodynamic bearings and elasto-hydrodynamic bearings. Design of straight and helical spur gears, bevel gears. Design of Engine components piston, connecting rod, crank shaft, flywheel.

## **5. MATERIAL SCIENCE AND METTALURGY**

Engineering Materials, Engineering properties of materials, Concept of plastic deformation of metals, concept of cold working and hot working, Heat treatment processes, Concept of alloy formation, types of alloys, solid solutions, factors governing solids solubility, Various types of steels, Iron-Carbon equilibrium diagram, T-T-T curves, Ceramics, Plastics and Composite Materials.

## **6. MANUFACTURING SCIENCE**

Merchant force analysis, Taylor's tool life equation, machine ability and machine economics, rigid small and flexible automation, NC, CNC. Recent machining methods like EDM, ECM and Ultrasonic Machining. Application of lasers and plasmas, analysis of forming processes. High energy rate forming jigs, fixtures, tools and gauges. Inspection of length, position, profile and surface finish, computer aided manufacturing.

## **7. PRODUCTION MANAGEMENT**

Production planning and control, forecasting-moving average, exponential smoothing, Operation Scheduling, assembly line balancing, product development, Break even analysis, Capacity planning PERT and CPM. Control operations inventory control, ABC analysis, EOQ models,



material requirement planning, job design, job standards, work measurement, quality management, quality analysis and control. Statistical quality control operation research linear programming, Graphical and simplex method. Transportation and assignment model, Single server queuing model.

## **8. THERMODYNAMICS**

Laws of Thermodynamics, Zeroth law, First law, Second law, Concepts on enthalpy and entropy, Gas Law Boyle's law, Charles' law, Properties of steam, Perfect gas equation, Thermodynamic cycles Carnot cycle, Rankine cycle, Otto cycle, Diesel cycle, Dual cycle, Brayton cycle, Refrigeration and air conditioning, Fuels and Combustion, Air compressors, Basics of Gas dynamics and flow through nozzles.

## **9. FLUID MECHANICS AND MACHINERY**

Classification of fluids. Properties of fluids viscosity, Newton's laws of viscosity, surface tension, capillarity etc. Fluid Statics, Fluid Dynamics, Energy equations, Dimensional Analysis, Laminar and Turbulent Flows, Flow around submersed bodies, Pumps and Turbines (Types, Principles of working and calculations)

## **10. IC ENGINES, FUELS AND COMBUSTION**

Spark ignition (SI) and compression ignition (CI) engines. Four stroke and two stroke engines. Mechanical, thermal and volumetric efficiency. Heat balance, Combustion process in SI and CI engines, Pre ignition, detonation in SI engines. Diesel knock in CI engines. Choice of engine fuels Octane and Cetane rating. Alternate fuels, carburation and fuel injection. Engine emission and control. Solid, liquid and gaseous fuels, stoichiometric air requirement and excess air factor, fuel gas analysis, higher and lower calorific values and their measurements.

## **11. HEAT TRANSFER, REFRIGERATION AND AIR CONDITIONING**

Modes of heat transfer, one and two dimensional heat conduction, Heat transfer from extended surfaces, Heat transfer by forced and free convection Heat exchangers. Fundamentals of diffusive and convective mass transfer. Radiation laws, heat exchange between black and non-black surfaces, Network analysis, Heat pump refrigeration cycles and systems, condensers, evaporators and expansion devices and controls. Properties and choice of refrigerant. Cooling load calculations, Solar refrigeration systems.

## **12. TURBO MACHINES AND POWER PLANTS**

Continuity, momentum and energy equations, adiabatic and isentropic flow, Fanno lines, Rayleigh lines. Theory and design of axial flow turbines and compressors. Flow through turbo machine blade, cascades, centrifugal compressor. Dimensional analysis and modeling. Selection of site for steam, hydro nuclear and stand-by power plants, selection base and peak load power plants. Modern high pressure High duty boilers, Draft and dust removal equipment. Fuel and cooling water systems. Heat balance, station and plant heat rates, operation and maintenance of various power plants, preventive maintenance, economics of power generation. Energy scenario in India.

### 13. AUTOMOBILE ENGINEERING

Main units of automobile chassis and body, different systems of the automobile, description of the main parts of the engine, motor vehicle act.

Power for Propulsion Resistance to motion, rolling resistance, air resistance, gradient resistance, power required for propulsion, tractive effort and traction, road performance curves.

Suspension System and Braking System Hydraulic braking system, breaking of vehicles when applied to rear, front and all four wheel, theory of internal shoe brake, design of brake lining and brake drum, different arrangement of brake shoes, servo and power brakes. Types spring.

Transmission Systems Layout of the transmission system, main function of the different components of the transmission system, transmission system for two wheel and four wheel drives. Hotchkiss and torque tube drives.

Gear box Sliding mesh, constant mesh and synchromesh gearbox, design of 3 speed and 4 speed gear box, over drive, torque converter, fluid coupling, semi and fully automatic transmission. Hookes joint, propeller shaft, differential, rear axles, types of rear axles, semi floating, there quarter floating and full floating types.

Front wheel Geometry and steering systems Camber, castor, kingpin inclination, toe-in and toe-out, centre point steering condition for true rolling, components of steering mechanism, power steering.

Electrical system of an automobile Starting system, charging system, ignition system, other electrical system.

Electrical vehicles History, electrical vehicles and the environment pollution, description of electric vehicle, operational advantages, present EV performance and applications, battery for EV, Battery types and fuel cells, Solar powered vehicles, hybrid vehicles. Methods to use different alternative fuels like LPG,CNG, bio fuels, fuel cell, hydrogen in automotive vehicles.

Aerodynamic drag of vehicles, shape optimization of cars, wind tunnels for automotive aerodynamics. Engine maintenance and servicing, Vehicle maintenance record keeping.

Ecological Concepts, Air Pollution controls, Waste management, Occupational Safety and Health procedures.

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