

# ODISHA PUBLIC SERVICE COMMISSION

## ADVERTISEMENT NO. 04 OF 2016-17

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

**WEBSITE – <http://opsconline.gov.in>**

Applications are invited On-line through the proforma application to be made available on WEBSITE (<http://opsconline.gov.in>) from **06.08.2016 to 07.09.2016** for recruitment to 21 (twenty one ) posts of Inspector of Motor Vehicle / Additional R.T.O. (Enforcement) / Assistant Works Engineer in Group-B of OTES under Commerce and Transport(Transport) Department in the scale of pay of Rs.9,300-34,800/- carrying Grade Pay of Rs.4600/- with usual Dearness and other allowances as may be sanctioned by the Government of Odisha from time to time.

2. **VACANCY POSITION : As per requisition filed by the Commerce and Transport (Transport) Department, the vacancy position along with reservation thereof is given below:**

Sl. No.	Category	Total Vacancy position
1	Un-reserved	12(04-w)
2	Scheduled Caste	02(01-w)
3	Scheduled Tribe	07(02-w)
Total		21(07-w)

(a) Out of the vacancies mentioned above, 01 post is reserved for Sports person.

The candidate belonging to "Sports person category" when selected as per reservation provided for him/her shall be adjusted against the category to which He/She belongs.

(b) In case of non-availability of eligible/suitable Women candidate(s) belonging to the respective category, the unfilled vacancies of that category shall be filled up by eligible/suitable Male candidate(s) of the same category.

(c) The Exchange of reservation between SC & S.T. will not be considered.

3. **AGE** : (i) A candidate must be under 32 (thirty two) years and above 21 (twenty one) years of age on the 1<sup>st</sup> April, 2016 i.e. he/she must have been born not earlier than 2<sup>nd</sup> April, 1984 and not later than 1<sup>st</sup> April, 1995.

( 2 )

The upper age limit is relaxable by 5 (five) years for candidates belonging to the categories of Scheduled Castes(S.C.), Scheduled Tribes(S.T.), Socially & Educationally Backward Classes (S.E.B.C.), Women and Ex-servicemen.

Provided that in case a candidate who comes under more than one category mentioned above, he/she will be eligible for only one age relaxation benefit, 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 only be accepted by the Commission.

**4. EDUCATIONAL QUALIFICATION :**

A candidate shall hold a Degree in -

- (a) (i) Automobile Engineering ;  
or
- (ii) Mechanical Engineering with Automobile engineering as a subject
- (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. Possession of a valid driving license for Transport Vehicle will be a pre-requisite for completion of probation period and confirmation in the service. Failure to possess a driving license for Transport Vehicle before completion of probation period shall make the candidates liable for termination from service”.

**6. APPLICATION FEE -**

A candidate is required to pay a non-refundable and non-adjustable fee of Rs.300/- (Rupees three hundred) only. **Candidates belonging to Scheduled Caste/Scheduled Tribe of Odisha only are exempted from payment of this fee.**

**7. METHOD OF SELECTION :**

The selection of candidates for recruitment to the post will be made on the basis of written test and Viva Voce Test.

- (i) Written examination - 100 Marks
- (ii) Viva Voce Test - 15 Marks

The Plan of Examination and broad outlines of the syllabi for the said examination are enclosed **at Appendix-I.**

**8. PLACE OF EXAMINATION :**

The written examination will be held at Cuttack.

**9. OTHER ELIGIBILITY CONDITIONS :**

- (a) (i) The candidate must be a citizen of India;
- (ii) The candidate claiming to be S.E.B.C., S.C. & S.T. category must be by birth and must belong to State of Odisha.
- (iii) The candidate must be of good mental condition, bodily healthy and free from any physical defect likely to interfere with the discharge of his/her duties in the service.
- (iv) The candidate must be able to speak, read and write Odia and must have passed a test in Odia language equivalent to Middle English School standard.

Provided that the candidates who have passed the matriculation examination or an equivalent examination with odia as their academic language and the candidates who have passed matriculation examination with non language papers through the medium odia, shall be exempted from passing the language test.

- (v) A candidate, who has more than one spouse living, will not be eligible for appointment unless the State Government has exempted his/her case from operation of this limitation for any good and sufficient reasons;
- (vi) Government servants, whether temporary or permanent, are eligible to apply provided that they possess the requisite qualification and are within the prescribed age-limit as provided under Para-3 & 4 of the Advertisement. They must inform their respective Heads of Offices in writing regarding submission of their applications for this recruitment and obtain "No Objection Certificate";

(vii) 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);

(viii) **Only those candidates, who fulfil the requisite qualification & are within the prescribed age limit etc. by the closing date of online application, will be considered eligible;**

(b) 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;

10. **OTHER CONDITIONS :**

(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 he/she 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 Examination Act 1988 (Odisha Act-2 of 1988) are applicable to the examination conducted by the Odisha Public Service Commission.

(iii) **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 Examination/viva voce will be provisional. If on verification at any stage before or after the examination/viva voce, 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 in regard to 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 posts are permanent. The period of probation is one year from the date he/she actually joins in the post and may be extended at the discretion of the Govt. The appointment can be terminated on one months notice from either side without assigning any reason thereof.

- (vii) 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.
- (viii) Candidates are required to take due care to annex with the printout/hard copy of online applications, the copies of certificates and other documents as stated under Para-11 of this advertisement.
- (ix) No one will be admitted to the examination unless he/she holds a certificate of admission uploaded in the website of OPSC. The eligible candidates are required to download their admission certificate from the website of Commission and produce the same before the Centre Supervisor for admission to the Examination Centre
- (x) All persons appointed under the Government of Odisha on or after 1<sup>st</sup> January, 2005 shall not be eligible for pension as defined under sub-rule(1) of Rule-3 of the Odisha Civil Service (Pension) Rules, 1992; but shall be covered by the defined Contribution Pension Scheme in accordance with the Odisha Civil Service (Pension) Amendment Rules, 2005;
- (xi) Any misrepresentation or suppression of information by the candidate in the online application, will result in cancellation of the candidature or penalty, as decided by the Commission be imposed on the candidate.
- (xii) 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.

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

Candidates are required to submit along with the printout/hard copy of online applications, true copies of the following documents duly attested by candidate or Gazetted Officer or Notary Public. The candidates are also required to mention on each document "submitted by me" and put their full signature on the same. **They must not attach original certificates to their applications.** Only those, who will be called for the viva voce test will be required to bring with them the original certificates, mark-sheets etc. of the attested copies for verification at the time of viva voce test.

(6)

If a candidate fails to furnish any of the original documents in respect of the attested copies submitted with the application for verification on the date of interview before the interview starts, he/she shall not be allowed to appear at the interview.

- (i) H.S.C. or equivalent certificate in support of declaration of age issued by the concerned Board/Council;
- (ii) Intermediate/+2 Examination Certificate or equivalent Certificate issued by the concerned Board/Council;
- (iii) B.Tech./B.E. Degree Certificate from recognized University;
- (iv) Mark-lists in support of all aforesaid Examinations passed (i.e. H.S.C. to B.Tech./B.E. Degree) including fail marks, if any, issued by the concerned Board/Council/University;

**NOTE** - (a) 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.

- (b) While filling up the relevant box of the online application form, the candidate has to mention details of marks secured in Annual examination leading to award of Degree.
  - (c) The maximum marks and mark secured in extra optional subject should not be taken into account.
- (v) (a) Attach two recent passport size photographs(unsigned & unattested) which has been uploaded with online application in printout/hard copy of online application form.  
(b) Certificates of conduct from the Principal/Proctor/Dean or Professor in charge of a Department of Teaching of the College or University in which he/she last studied;
  - (vi) Caste Certificate by birth in support of claim as S.Cs./S.Ts./S.E.B.Cs., wherever applicable (Please see Note-1);
  - (vii) Required pass certificate in Odia language in M.E. School Standard or HSC examination.
  - (viii) Identity Card/Certificate issued by Rajya Sainik Board or Zilla Sainik Board, wherever applicable, in case of Ex-Serviceman.

- (ix) Identity Card issued by the Director of Sports, Odisha in case of Sports Persons wherever applicable, in case of Sports Persons.
- (x) OPSC copy of challan (pay in slip) for payment of fee at SBI.
- (xi) If a candidate claims to possess qualification, equivalent to the prescribed qualification, the rule/authority (With number and date) under which it is so treated, must be furnished with the printout/hard copy of the online Application Form.

**NOTE 1** : Candidates claiming to be belonging to S.C./S.T./S.E.B.C. category by birth are required to submit copy of the relevant Caste Certificate 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 from the date of advertisement.

- (i) Women candidates belonging to S.C./S.T./S.E.B.C. 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.
- (ii) OBC CERTIFICATES **WILL NOT BE ACCEPTED** IN LIEU OF S.E.B.C. CERTIFICATES.
- (iii) Community (Caste status) once mentioned by the candidates shall not be changed under any circumstances.

The competent authorities are: - District Magistrate/Collector or Additional District Magistrate or Sub-divisional Magistrate/Sub-Collectors or Executive Magistrates or Revenue Officers, not below the rank of Tahasildar /Additional Tahasildar of Government of Odisha;

**NOTE 2** : Degree Certificate, Caste Certificate, Odia Test Pass Certificate, Discharge Certificate of Ex-servicemen, and Identity Card of Sportspersons have been issued by the competent authority within the last date fixed for receipt of applications as indicated above.

- (xii) If one candidate furnishes more than one online application, the Commission will consider the information/data of latest application having higher ID Number.

12. **HOW TO APPLY:**

- a. **Candidate must go through details of this Advertisement before filling up online application.**
- b. Candidates must apply online through the website <http://opsconline.gov.in>. Applications received through any other mode would not be accepted and summarily be rejected.
- c. **Before filling up the online application form, the candidates must go through the following documents available at OPSC portal.**
  - i **Instruction to fill up online application.**
  - ii **Guideline for scanning and Uploading the Photograph, Full Signature & Left Thumb Impression.**
- d. Candidates are required to upload the scanned image of latest passport size photograph along with scanned image of his/her full signature and scanned image of Left 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 2 copies of latest passport size photograph which is uploaded to the online application form for future use.
- f. The candidates are required to take a printout of the finally submitted Online Application Form for future use and take a printout of Online Challan (Pay-in-Slip) for payment of requisite fee at any branch of State Bank of India (SBI). The Fee(s) paid shall not be refunded under any circumstances nor can the fee(s) be adjusted or held in reserve for any other examination or recruitment.
- g. On successful submission of application form, an Unique Registration ID will be displayed on the screen as well as top of the application form. Candidates are requested to note down the Unique Registration ID and use it in future correspondence.
- h. Candidates are required to send the Printout/Hard copy of the filled in Online Application Form duly signed under the declaration along with copies of required certificates and documents etc., as provided under para-11 of long advertisement and the OPSC copy of Challan showing payment of application fee, by Registered Post/Speed Post/Courier Service to the Special Secretary, Odisha Public Service Commission, 19, Dr. P.K. Parija Road, Cuttack-753001 so as to reach the same in the office of the OPSC **on or before 20.09.2016.**



- i. The envelope containing the printout/hard copy of the online application along with copies of requisite certificates and documents etc. must be superscribed "APPLICATION FOR **Inspector of Motor Vehicle / Additional R.T.O. (Enforcement) / Assistant Works Engineer**. Application received after the closing date shall not be entertained. The Commission will not take any responsibility if the application is not received in time.
- j. **The candidates are advised to submit the Online Application Form well in advance without waiting for the closing date to avoid last hour rush.**
- k. Certificate of Admission to the Examination, or Interview of the eligible candidates will be uploaded in the Website of OPSC prior to the date of examination/interview which will be published in the Website and News paper. The candidates are required to download their Admission Certificate for examination/intimation letter for vv test from Website. No separate correspondence will be made on this score.

**13. FACILITATION COUNTER AND WEBSITE FOR GUIDANCE OF CANDIDATES:-**

During filling up the online application form, the candidate may contact facilitation counter of OCAC over Telephone **No1800 345 6770 or 155335** for any technical guidance only on working days.

Regarding difficulty in payment of fee, if any, the candidates may contact SBI over Telephone No. **0671-2368267 & 9437039604**.

In case of any guidance/information on advertisement and recruitment, candidates may contact the O.P.S.C. Facilitation Counter over Telephone No.0671-2304141/ 2305611 & Extn.-218 in any working day between 10.30 A.M. to 1.30 P.M. & 2.00 P.M. to 5.00 P.M.

The candidates are required to visit the Website of the Commission at **www.opsc.gov.in** for detail information about the programme of the examination, interview, notice regarding rejection of applications, other important notices etc. and also keep track of publication of various notices to the effect in the leading local daily news papers for information.

(10)

**CLOSING DATES**

- (A) ON LINE APPLICATIONS SHALL BE AVAILABLE IN THE WEBSITE FROM 06.08.2016 TO 07.09.2016 TILL 11.59 P.M.
- (B) LAST DATE FOR RECEIPT OF APPLICATION FEE AT ANY BRANCH OF STATE BANK OF INDIA IS 09.09.2016.
- (C) LAST DATE FOR RECEIPT OF HARD COPY / PRINT COPY OF APPLICATION IS 20.09.2016.

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

Cuttack  
DT.01.08.2016

16/08/2016  
SECRETARY,  
ODISHA PUBLIC SERVICE COMMISSION,  
CUTTACK.

## APPENDIX – I

### Plan of Examination , Standard and syllabi

1. The written examination will 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.

Pattern of examination	No. of questions	Total marks	Duration of the examination.
Objective Type/ Multiple Choice	100	100	01.30 hrs.

2. The standard of papers will be that of B.Tech. Examination.
3. 0.25 marks shall be deducted for each wrong answer.
4.
  - (i) All question papers will be set in English.
  - (ii) The candidates are not allowed to bring calculators or any other electronic devices to the examination hall/examination campus for use.
  - (iii) Mobile phones, pagers or any other communication devices are not allowed inside the premises of the Examination Centre and Office of the Commission.
  - (iv) The candidates must be very much careful to fill-up and darken his/her Roll No, Question Booklet Series in the **Answer Sheets** and also to fill-up Question Booklet Series, Question Booklet Serial Number and Answer Sheet Serial Number in the **Attendance Sheets** carefully and correctly. **Wrongly filled up Answer Sheets are liable for rejection.**

Any infringement of these instructions shall entail disciplinary action including ban from the present and / or future examination.

## 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.

(2)

**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 inmoving 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.

(4)

**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 , Perfomance, 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, Trasformers for automotive vehicules. Sensors, Micro Processors, Transducers.

**28. MODERN VEHICLE TECHNOLOGY**

Electric and hybrid vehicles. Solar powred 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 MANAGMENT**

Different service garages & its layout, Tools for servicing, Enginemaintenance 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 submerged 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.