मध्यप्रदेश लोक सेवा आयोग
रेसीडेन्सी एरिया, इन्दौर

राज्य अभियांत्रिकी सेवा परीक्षा–2025

-::परीक्षा योजना::-

(अ) अंक–योजना :–

परीक्षा	प्रश्नों की संख्या	पूर्णांक	अवधि
खंड 'अ'–सामान्य अध्ययन	50	150	3 घंटे
खंड 'ब'– विषय– सिविल/मेकेनिकल / इलेक्ट्रिकल /कृषि इंजीनियरिंग	100	300	
योग	150	450	
साक्षात्कार	-	50	
कुल अंक	-	500	

(ब) प्रश्न पत्र योजना :–

1. परीक्षा का आयोजन एक सत्र में 03 घंटे की अवधि का होगा।
2. खंड 'अ' विषय– सामान्य अध्ययन से 50 प्रश्न वस्तुनिष्ठ प्रकार के होंगे तथा खंड–'ब' में **सिविल/मेकेनिकल/इलेक्ट्रिकल/कृषि इंजीनियरिंग** विषय से संबंधित प्रश्नपत्र में 100 प्रश्न वस्तुनिष्ठ प्रकार के होंगे। इस प्रकार प्रश्न पत्र में खण्ड 'अ' तथा 'ब' मिलाकर 150 वस्तुनिष्ठ प्रश्न शामिल होंगे। प्रत्येक प्रश्न 03 अंको का होगा। इस प्रकार दोनों खंडों के प्रश्न पत्र का पूर्णांक 450 अंकों का होगा।
3. प्रश्न पत्र वस्तुनिष्ठ (बहुविकल्पीय) प्रकार का होगा। प्रत्येक प्रश्न के उत्तर हेतु चार विकल्प (A,B,C,D) होंगे। अभ्यर्थी को उक्त विकल्पों में से केवल एक सही विकल्प का चयन करना होगा। अभ्यर्थी द्वारा एक से अधिक विकल्पों का चयन करने पर उत्तर निरस्त कर दिया जाएगा। **(अभ्यर्थी को एक से अधिक विकल्प चयन करने का अधिकार नहीं होगा। ऐसा किए जाने पर उसे अनुत्तरित (अन अटेम्पटेड) माना जाएगा।)**
4. दोनों खंडो (खंड–'अ' तथा खंड–'ब') में पृथक–पृथक 40 प्रतिशत अंक प्राप्त करना अनिवार्य होगा। मध्यप्रदेश के अधिसूचित अनुसूचित जाति (SC), अनुसूचित जनजाति (ST) तथा अन्य पिछड़ा वर्ग (OBC), आर्थिक रूप से कमजोर वर्ग (EWS) एवं दिव्यांगजन (PH) श्रेणी के आवेदकों को परीक्षा में उत्तीर्ण होने हेतु 10–10 प्रतिशत अंकों की छूट दी जाएगी इस प्रकार उक्त श्रेणी के आवेदकों को परीक्षा में उत्तीर्ण होने हेतु प्रत्येक खंड में पृथक–पृथक न्यूनतम 30 प्रतिशत अंक प्राप्त करना अनिवार्य होगा। इस प्रकार लिखित परीक्षा की मेरिट दोनों खंडों के प्राप्तांको को जोड़कर बनेगी।

07.01.2026

5. परीक्षा में ऋणात्मक मूल्यांकन का प्रावधान है। मूल्यांकन (3R-W) = प्राप्तांक पद्धति से होगा। **जहाँ R = सही उत्तरों की संख्या तथा W = गलत उत्तरों की संख्या होगी।** प्रत्येक सही उत्तर के लिए 3 अंक प्रदाय किए जाएँगे एवं प्रत्येक गलत उत्तर के लिए 1 अंक काटा जाएगा।

6. प्रश्न पत्र का खंड–'अ' हिन्दी एवं अंग्रेजी दोनों भाषाओं में होगा एवं खंड–'ब' **सिविल/मेकेनिकल/ इलेक्ट्रिकल/ कृषि इंजीनियरिंग** विषय का प्रश्न पत्र केवल अंग्रेजी भाषा में होगा।

7. परीक्षा परिणाम के साथ ही अभिलेख–प्रेषण हेतु अंतिम तिथि निर्धारित कर परीक्षा में प्रावधिक सफल अभ्यर्थियों से उनकी अर्हता से संबंधित सभी अभिलेख प्राप्त किए जाएँगे तथा केवल उन्हीं अभ्यर्थियों को साक्षात्कार हेतु आमंत्रित किया जाएगा जो अभिलेखों की सूक्ष्म जाँच उपरान्त अर्ह पाए जाएँगे। अंतिम निर्धारित तिथि पश्चात आयोग द्वारा अभिलेख स्वीकार्य नहीं किए जाएंगे।

8. **साक्षात्कार :–**

साक्षात्कार 50 अंकों का होगा। साक्षात्कार हेतु कोई न्यूनतम उत्तीर्णांक निर्धारित नहीं हैं।

(स) चयन–प्रक्रिया :–

1) चयन–प्रक्रिया के प्रथम चरण में एक प्रश्न पत्र की ऑफलाइन पद्धति (OMR Sheet आधारित) परीक्षा/ऑफलाइन परीक्षा का आयोजन किया जाएगा।

2) परीक्षा उपरान्त परीक्षा में पूछे गए प्रश्नों की प्रावधिक उत्तर कुंजी तैयार कर आयोग की वेबसाइट www.mppsc.mp.gov.in पर प्रकाशित कर 05 दिवस की अवधि में आपत्तियाँ प्राप्त की जाएगी। इस अवधि के पश्चात् प्राप्त किसी भी अभ्यावेदन पर कोई विचार एवं पत्राचार नहीं किया जाएगा। आपत्ति हेतु दिया गया शुल्क किसी भी स्थिति में वापस नहीं किया जाएगा। प्राप्त आपत्तियों पर आयोग द्वारा गठित विषय–विशेषज्ञ समिति द्वारा आपत्तियों पर विचार कर निम्नांकित कार्यवाही की जाएगी :–

   1. ऐसे प्रश्न जिनका प्रावधिक कुंजी में दिए गए विकल्पों में से गलत उत्तर दिया गया है और विकल्पों में अन्य विकल्प सही है, तब प्रावधिक उत्तर कुंजी को संशोधित किया जाएगा ।
   2. प्रश्न पत्र में अनुवाद की भाषा में भिन्नता की स्थिति में केवल हिन्दी अनुवाद ही मान्य होगा।
   3. ऐसे प्रश्न जिसका दिए गए विकल्पों में एक से अधिक सही उत्तर है, सभी सही उत्तरों को मान्य किया जाएगा।
   4. ऐसे प्रश्न जिसका दिए गए विकल्पों में एक भी सही उत्तर न हो, प्रश्न को प्रश्न–पत्र से विलोपित किया जाएगा।

5. विषय–विशेषज्ञ समिति द्वारा समस्त अभ्यावेदनों पर विचार करने के पश्चात् अंतिम उत्तर कुंजी बनाई जाएगी तथा आयोग द्वारा वेबसाइट www.mppsc.mp.gov.in पर प्रकाशित की जाएगी। अंतिम उत्तर कुंजी के प्रकाशन के पश्चात् अभ्यर्थियों के कोई भी आपत्ति/पत्र व्यवहार मान्य नहीं किया जाएगा। विषय–विशेषज्ञ समिति का निर्णय अंतिम होगा ।
6. उपर्युक्त अनुसार परीक्षण के उपरांत समिति द्वारा विलोपित किए गए प्रश्नों के लिए प्रश्न पत्र में उपस्थित सभी परीक्षार्थियों को प्रश्न के पूर्णांक प्रदान किए जाएंगे। अंतिम उत्तर कुंजी के प्रकाशन अनुसार अभ्यर्थियों का मूल्यांकन कर परीक्षा–परिणाम घोषित किया जाएगा।

3) परीक्षा में प्राप्तांक के गुणानुक्रम के आधार पर विभिन्न प्रवर्गों हेतु विज्ञापित रिक्तियों के अधिकतम 3 गुना तथा समान अंक प्राप्त करने वाले अभ्यर्थियों को साक्षात्कार में अभिलेख प्रस्तुत करने हेतु प्रावधिक सफल घोषित किया जाएगा।

4) साक्षात्कार में अनुपस्थित रहने वाले अभ्यर्थियों को चयन के लिए अनर्ह माना जाएगा। साक्षात्कार के लिए आवेदकों को बुलाने के संबंध में आयोग का निर्णय अंतिम होगा। यह निर्णय आयोग की वेबसाइट www.mppsc.mp.gov.in पर उपलब्ध रहेगा। अभ्यर्थी समय–समय पर आयोग की वेबसाइट का अवलोकन करते रहें।

5) आयोग की परीक्षा प्रणाली में पुनर्मूल्यांकन/पुनर्गणना का कोई प्रावधान नहीं है। इस विषय में प्राप्त अभ्यावेदनों पर कोई कार्यवाही नहीं की जाएगी।

टीपः– अभ्यर्थी भलीभांति तय कर लें कि वे संबंधित विषय की अनिवार्य अर्हता धारित करते हैं, तभी आवेदन करें। आयोग द्वारा परीक्षा के किसी भी चरण में उनके दस्तावेज मंगाए जा सकते हैं। गलत जानकारी देने पर परीक्षार्थी को विवर्जित (डिबार) किया जा सकेगा।

परीक्षा नियंत्रक

राज्य अभियांत्रिकी सेवा परीक्षा–2025
खंड–'अ'
पाठ्यक्रम– सामान्य अध्ययन

State Engineering Service Exam- 2025
Section-'A'
Syllabus-General Studies

इकाई–01: मध्यप्रदेश का इतिहास।

- मध्यप्रदेश का प्राचीन इतिहास–प्रागैतिहासिक काल, आद्यऐतिहासिक काल, ऐतिहासिक काल।
- मध्यप्रदेश का मध्यकालीन इतिहास।
- मध्यप्रदेश का आधुनिक इतिहास।
- मध्यप्रदेश में स्वतंत्रता आंदोलन।
- मध्यप्रदेश का जनजातीय इतिहास एवं जनजातीय साहित्य।

UNIT-01: History of Madhya Pradesh

- Ancient History of Madhya Pradesh - Prehistoric Period, Protohistoric Period and Historic Period.
- Medieval History of Madhya Pradesh.
- Modern History of Madhya Pradesh.
- Freedom Movement in Madhya Pradesh.
- Tribal History and Tribal Literature of Madhya Pradesh.

इकाई–02: मध्यप्रदेश का भूगोल।

- राज्य की भौगोलिक स्थिति तथा विस्तार, प्रमुख नदियाँ, पर्वत।
- जलवायु: मौसम, मिट्टियाँ, तापमान, वर्षा, वनों के प्रकार और वनोपज।
- कृषि: प्रमुख फसलें, सिंचाई के स्रोत, सिंचाई परियोजनाएँ।
- ताप विद्युत परियोजनाएँ, गैर–पारंपरिक ऊर्जा स्रोत, प्रमुख खनिज ।
- जनसंख्या का आकार, वृद्धि और साक्षरता, यातायात, खाद्य प्रसंस्करण उद्योग।

UNIT-02: Geography of Madhya Pradesh

- Geographical location and extent of the state, major Rivers, mountains.
- Climate: Seasons, Soils, Temperature, Rainfall, Forest types and Forest produce.
- Agriculture: Major crops, Sources of irrigation, Irrigation projects.
- Thermal power projects, Non-conventional energy sources, Major Minerals.
- Population size, Growth and Literacy, Transportation, Food processing industries.

इकाई–03 मध्यप्रदेश की राजनीति एवं अर्थव्यवस्था।

Politics and Economy of Madhya Pradesh

भाग–'अ'

मध्यप्रदेश की राजनीति

- राज्यपाल, मुख्यमंत्री, मंत्रीमंडल, विधानसभा, उच्च न्यायालय, लोकायुक्त।
- राज्य सचिवालय, मुख्य सचिव, संभागायुक्त, पुलिस कमिश्नर।
- जिला प्रशासन, नगरीय प्रशासन, स्थानीय स्वशासन, पंचायती राज संस्थाएँ।
- राज्य चुनाव आयोग, राज्य सूचना आयोग, राज्य अनुसूचित जाति आयोग, राज्य अनुसूचित जनजाति आयोग, राज्य पिछड़ा वर्ग आयोग, राज्य महिला आयोग।
- अनुसूचित जाति एवं अनुसूचित जनजाति अत्याचार निरोधक अधिनियम, 1989; पंचायत अनुसूचित क्षेत्रों तक विस्तार (पेसा) अधिनियम, 1996; पर्यावरण संरक्षण अधिनियम, 1986; मध्यप्रदेश गौवंश वध प्रतिषेध अधिनियम, 2004।

Politics of Madhya Pradesh

- Governor, Chief Minister, Cabinet, Vidhan Sabha, High Court, Lokayukta.
- State Secretariat, Chief Secretary, Divisional Commissioner, Police Commissioner.
- District Administration, Urban Administration, Local Self Government, Panchayati Raj Institutions.
- State Election Commission, State Information Commission, State Scheduled Castes Commission, State Scheduled Tribes Commission, State Backward Classes Commission, State Commission for Women.
- Schedule Caste and Schedule Tribe Prevention of Atrocities Act, 1989; Panchayats Extension to Schedule Areas (PESA) Act, 1996; Environment Protection Act, 1986; Madhya Pradesh Govansh Vadh Pratishedh Adhiniyam, 2004.

भाग–'ब'

मध्यप्रदेश की अर्थव्यवस्था

- मध्यप्रदेश की अर्थव्यवस्था का अवलोकन।
- मध्यप्रदेश में कृषि एवम् ग्रामीण विकास की स्थिति।
- मध्यप्रदेश में औद्योगिक एवम् आधारभूत ढाँचे की संरचना का विकास।
- मध्यप्रदेश में शिक्षा, स्वास्थ्य एवं कौशल विकास की स्थिति।
- सतत विकास लक्ष्य, व्यवसायिक सुगमता एवम् बहुआयामी गरीबी सूचकांक में मध्यप्रदेश की स्थिति।

Economy of Madhya Pradesh

- Overview of the Economy of Madhya Pradesh.
- Status of Agriculture and Rural Development in Madhya Pradesh.
- Development of Industrial and Infrastructural Framework in Madhya Pradesh.
- Status of Education, Health and Skill Development in Madhya Pradesh.
- Status of Madhya Pradesh in Sustainable Development Goals, Ease of Doing Business and Multidimensional Poverty Index.

इकाई–04 **मध्यप्रदेश की जनजातियाँ : विरासत, लोक संस्कृति एवं लोक साहित्य (म.प्र. के विशेष संदर्भ में)**

- मध्यप्रदेश में जनजातियों का भौगोलिक विस्तार, जनजातियों से संबंधित संवैधानिक प्रावधान।
- मध्यप्रदेश की प्रमुख जनजातियाँ एवं विशेष पिछड़ी जनजातियाँ, जनजातियों के कल्याण के लिए योजनाएँ।
- मध्यप्रदेश की जनजातीय संस्कृतिः परम्पराएँ, विशिष्ट कलाएँ, त्यौहार, उत्सव, भाषा, बोली एवं साहित्य।
- मध्यप्रदेश की जनजातियों का भारत के स्वतंत्रता आंदोलन में योगदान एवं राज्य के प्रमुख जनजातीय व्यक्तित्व। मध्यप्रदेश में जनजातियों से संबंधित प्रमुख संस्थान, संग्रहालय, प्रकाशन आदि।
- मध्यप्रदेश की लोक संस्कृति एवं लोक साहित्य।

UNIT-04 Tribes of Madhya Pradesh : Heritage, Folk Culture and Folk Literature (with special reference of M.P.)

- The geographical spread of tribes in Madhya Pradesh, constitutional provisions related to tribes.
- Major tribes of Madhya Pradesh and Particularly Vulnerable Tribal Groups (PVTGs). Tribal welfare programs.
- Tribal culture of Madhya Pradesh: Traditions, Special arts, festivals, celebrations, language, dialects and literature.
- Madhya Pradesh tribal's contribution to the freedom struggle of India and iconic tribal personalities of state. Popular institutes related to tribes of Madhya Pradesh, tribal museums, publications etc.
- Folk culture and folk literature of Madhya Pradesh.

इकाई–05 **अंतर्राष्ट्रीय, राष्ट्रीय व मध्यप्रदेश की महत्वपूर्ण समसामयिक घटनाएँ तथा सूचना एवं संचार प्रौद्योगिकी**

- महत्वपूर्ण अंतर्राष्ट्रीय एवं राष्ट्रीय समसामयिक घटनाएँ।
- मध्यप्रदेश की महत्वपूर्ण समसामयिक घटनाएँ एवं प्रमुख जनकल्याणकारी योजनाएँ।
- मध्यप्रदेश के चर्चित व्यक्तित्व एवं महत्वपूर्ण स्थान।
- कंप्यूटर, सूचना एवं संचार प्रौद्योगिकी, ई–गवर्नेंस।
- आर्टिफिशियल इंटेलिजेंस (एआई), मशीन लर्निंग, क्लाउड कंप्यूटिंग, डेटा साइंस और इंटरनेट ऑफ थिंग्स का आधारभूत ज्ञान।

UNIT-05 Important Contemporary Events of International, National and Madhya Pradesh and Information and Communication Technology

- Important International and National Contemporary events.
- Important Contemporary events and Major Public Welfare Schemes of Madhya Pradesh.
- Prominent Personalities and Important Places of Madhya Pradesh.
- Computers, Information & Communication Technology, E-Governance.
- Basic knowledge of Artificial Intelligence (AI), Machine Learning, Cloud Computing, Data Science and Internet of Things.

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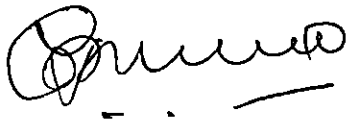

Syllabus for MP State Engineering Services
(Civil Engineering)

Unit 01 ***Highway Engineering***

- Introduction: History, Classification, Elements, Alignments, Geometrical cross section and Rural roads.
- Flexible and Rigid pavements and Joints.
- Traffic Engineering: Characteristics, Studies, Operation and control intersections, Rotary design, Elements, Signs and Signals.
- Planning, Lighting, Marking, Drainage, Accidents.
- Materials, Annuity models of construction, Amenities, Maintenance, Flyover.

Unit 02 ***Hydraulics***

- Introduction: Fluid properties, Pressure and its measurement, Total pressure and centre of pressure, Buoyancy and Flotation.
- Kinematics and Dynamics: Types of fluid and flow, Motion, Methods of classification, Principles of flow, all equations and their applications on measurement and machines.
- Pipe flow, Viscous flow, Dimensional and Model analysis.
- Open channel flow: Introduction, Equations, Channel sections, Uniform, nonuniform and gradually varied flow.
- Machines and Power transmission: Pumps and Turbines, Water hammer, Surge tank, Penstock.

Unit 03 ***Geo Technical Engineering***

- Introduction: Definitions, Classification, Properties and all tests on soil, analysis and all instruments of soil testing.
- Stress and strength: Stress distribution and shear strength.
- Earth pressure and Slope stability: Types, Theories, Methods.
- Foundation: Shallow, Deep, Sheet pile, Bulkhead and machine foundation. Classification, analysis and design.
- Soil improvement: Consolidation, Compaction, Grouting, Geo synthesis, Ground improvement techniques.

Unit 04 ***Environment and Public Health Engineering***

- Water: Quality and demand. Characteristics, analysis and instruments. Distribution system. Urban and Rural water supply.
- Wastewater: Characteristics, analysis and instruments. Collection and disposal. Design and maintenance of sewer. Sewerage schemes and rural sanitation.
- Treatment: Water treatment, Wastewater treatment.
- Solidwaste: Characteristics, analysis and instruments. Classification, Collection, Treatment and Disposal.
  Air pollution: Effects on human, animal, plant and material. Characteristics, analysis and instruments. Control equipments.
- Acts and standards: Environment protection act. All waste management rules and standards. National Clean Air Program (NCAP) document of Govt. of India, Smart city with respect to environment.

Unit 05 ***Construction Management***

- Investigation methods: Construction methods, Scheduling and its methods, False work.
- Tender and contract: Starting from preparation to execution including litigation.
- Equipments: All construction equipment with their selection, Construction, Operation, Function, Output, Maintenance and all associated cost.
- MPPWD conventional and online procedure and all forms including accounts and Store.
- Site organization, Labour laws, Accident and safety, Disaster management, Professional ethics and values.

Unit 06 ***Structural analysis***

- Forces, Centre of gravity and Moment of Inertia, determinate frames and trusses, Simple and principal stress & strain, Shear force and Bending moment diagrams.

- Theory of simple bending, Bending and shear stress distribution, Deflection, Torsion of shaft, Column and strut.
  Virtual work and strain energy principles for beam and frame, Indeterminate structure. Arches, Suspension cable. Influence line diagram for trusses, arches and frames.
  Plastic theory, Theories of failure, Combined direct and bending stresses, Flexibility and stiffness method.

Unit 07 ***Structural design***

RCC: Limit state method of design of RCC structures, Shear, Bond, Development length.
RCC: Design of Slab, Beam, Column, Isolated and Combined footing, Staircase, Retaining walls as per latest Indian standards.
Steel: Limit state method of design of tension and compression member, Beam, Beam-column, Plate girder, Truss member.

- Steel: Design of structural connections-simple and eccentric, Beam-column connection, Plate girder and truss connection as per latest Indian standards.
  Introduction to prestress design and bridge engineering.

Unit 08 ***Surveying and Estimating costing***

Topographic Survey: All instruments and accessories, Conventional and electronic linear measurement, Angular measurement, Total station.

- Trigonometric leveling: Theodolite, Techometry, Mapping and sensing, Curves.
  Remote sensing: Introduction and development, Application in Civil Engineering, Geographic Information System (GIS), Global Positioning System (GPS), Satellite Mapping.
  Quantity estimate: Principles of estimating, Types and methods of estimate, Measurement and abstract, Bill of quantities.
  Cost estimate: MP government schedule of rates, Rate analysis, Factor affecting cost of work, Valuation.

Unit 09 ***Water Resources Engineering***

- Irrigation - Necessity, Scope, Benefits and Effects, Development, Methods, Systems, Ground water and Well irrigation.
- Soil crop water relationship: Evapotranspiration, Consumptive use, Duty, Delta, Quantity and quality of water, Wilting coefficient & field capacity, Efficiencies.
- Hydrology: Precipitation and measurements, Infiltration, Runoff, Hydrograph, Floods.
- Canals & structures: Types, Design, Alignment, Lining and Maintenance, Regime theories, Regulators, Cross drainage works, Falls, Outlets and Escapes, Water logging and Drainage.
- Storage and Diversion works: Dams, Spillways, Weir, Barrage, Energy dissipation.

Unit 10 ***Construction Material and Technology***

- Materials: All conventional and modern construction materials, tests and IS codes.
  Concrete: Ingredients, Strength, test, IS codes, Design Mix, Ready Mix Concrete.
- Building components and elements: All Masonry, Plaster and Pointing, Floors, Roofs, Door-Window, Staircase.
- Planning: Principles, Bye-laws, National Building Code, Urban local body's rules and regulations.
- Building provisions: Plumbing, Sanitary, Electricity, Fire Safety, Thermal and sound acoustics, Security, Green building, Rain water harvesting.

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MECHANICAL ENGINEERING

1. Engineering Materials, Measurements and Heat Treatment

- **Basics of Materials:** Classifications of materials. Engineering materials and their properties. Iron carbon phase diagram. Testing of materials: tensile, compressive, hardness, non-destructive testing.
- **Metallic & Non-metallic Materials:** Classifications: Metallic & Non-metallic Materials. Ferrous and non-ferrous metals. Steel & Cast Iron: types, composition, properties and applications. Stress strain diagram for steel and cast iron. Plastics: types, properties, uses. Glass: types, manufacturing, properties, uses.
- **Composites, Smart materials & Nano-materials:** Types, properties, applications.
- **Measurements:** Static and dynamic characteristics of measurement. Basic elements of a measurement system. Linear and angular measurements. Instruments: sine bar, slip gauges, micrometres, Comparators.
- **Heat Treatment:** Need, classification, types of heat treatment process and their applications.

2. Engineering Mechanics, Mechanisms and Machines

- **Force, Stress & Strain analysis:** Analysis of system of forces and equilibrium. Centroid and center of gravity. Stress and strain in two dimension, compound stresses and strains. Mohr's circle. Thermal stresses.
- **Beams and Columns:** Types of beams, Stresses in beams, Deflection of beams, Shear force and bending moment diagrams, Buckling of column using Euler's theory, Torsion, Thin pressure vessels, Theories of Failure.
- **Kinematics:** Velocity and acceleration, types of kinematic pairs. Cams and followers with uniform acceleration and retardation. Free and forced vibrations with single degree of freedoms. Critical speed of shafts. Gear geometry and tooth profiles, law of gearing, involute profile, interference. Helical, spiral and worm Gears. Gear Trains.
- **Dynamics:** Different types of mechanisms. Slider-crank mechanisms. Analysis of planar mechanisms. Balancing of rotating and reciprocating masses.
- **Gyroscope:** Gyroscopic couple. Gyroscopic stability.

3. Design of Machine Elements

- Concepts of engineering design. Fundamentals of machine design. Design for static and dynamic loading. Fatigue strength and the S-N curve.
- Design of bolted, riveted and welded joints.
- Design of shafts, gears and bearings.
- Design of helical springs, rigid and flexible couplings.
- Design of brakes, clutches.

4. Manufacturing Processes and Production Engineering

- **Basic Manufacturing Processes:** Classification of manufacturing processes. Processes and applications of casting, welding, forging, forming, grinding.
- **Machine Tools:** Classification of machine tools. Basic elements, types and operations performed on lathe, milling, drilling.
- **Theory of Metal Cutting:** Chip formation mechanism, chip types, chip control. Tool geometry of single point cutting tool. Tool signature. Merchant's circle force analysis. Cutting tool wear and tool life. Taylor's tool life equation. Machinability and its measurement. Economics of metal machining.
- **Advanced Machining Processes:** Advanced machining processes: Abrasive Jet Machining (AJM), Ultrasonic Machining (USM), Electro Chemical Machining (ECM), Electro-Discharge Machining (EDM), Electron Beam Machining (EBM), and Laser Beam Machining (LBM).
- **Surface Finish:** Surface roughness terminology. Different methods of surface roughness/finish measurement. Limits, fits and dimensional/geometrical tolerances. Computer vision system based measurement. Coordinate measuring machines (CMM).

5. Industrial Engineering and Operations Research

- **Production Planning and Control:** Functions of PPC. Planning, forecasting, routing, scheduling, work order, dispatching and follow-up. Gantt chart. Types of productivity, Method study, Time study. Plant layouts.
- **Inventory Control:** Purchasing and storing, Economic order quantity (EOQ), Inventory control techniques, ABC analysis.
- **Operations Research:** Different types of models. Formulation of linear programming problems (LPPs). Simplex algorithm. Assignment models. Transportation problems. Simple queuing problems. Control charts for variables and attributes. CPM and PERT techniques.
- **Entrepreneurship:** Theories of entrepreneurship. Entrepreneur traits and behaviour, Opportunity analysis, sources of funds, entrepreneur development programs.
- **Financial Management:** Forms of business ownerships. Balance sheet, profit and loss account, fund flow and cash flow statements. Breakeven Point (BEP) and Financial Ratio Analysis, Pay-Back period, Net Present Value (NPV) and Capital budgeting.

6. Thermodynamics & Internal Combustion Engines

- **Basic Concepts & First Law of Thermodynamics:** Thermodynamic properties. Zeroth Law. First law for open and closed systems.
- **Second Law of Thermodynamics:** Second law of thermodynamics, entropy, availability and exergy analysis.
- **Power Cycles:** Gas power cycles: Otto cycle, Diesel cycle, Dual cycle, Brayton cycle. Vapour power cycles: Rankine cycle.
- **I. C. Engines:** SI and CI engines, engine system and its components. Combustion processes. Performance characteristics and testing of IC Engines. Carburetion and fuel injection, modern trends in IC engines.
- **I. C. Engine Fuels & Emission:** Octane and Cetane number. Engine emissions and emission control. Emission standards.

7. Fluid Mechanics and Machines

- Basic concepts and properties of fluid.
- Manometry. Fluid Statics. Buoyancy. Continuity equation. Momentum and Energy Equations. Equations of Motion.
- Bernoulli's equation and its applications. Viscous flow of incompressible fluids. Laminar and turbulent flows.
- Flow through pipes, head losses in pipes. Non dimensional numbers.
- Impulse and reaction hydraulic turbines, velocity diagram of hydraulic turbines, specific speed and unit quantities.

8. Heat Transfer, Refrigeration and Air Conditioning

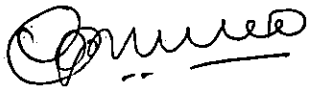
- **Conduction:** Basic laws of heat transfer. Steady and unsteady state heat conduction. Heat conduction through walls and pipes, heat transfer through fins, dimensionless numbers, lumped parameter analysis, overall heat transfer coefficient.
- **Convection & Radiation:** Free and forced convection. Radiation heat transfer, concept of black and grey body, shape factor.
- **Heat Exchangers:** Classification, effectiveness of parallel and counter flow heat exchangers. LMTD and NTU approach and their applications. Fouling factor.
- **Refrigeration:** Principles and methods of refrigeration. Air refrigeration system, Vapour compression system. Vapour absorption system. Properties of refrigerants, environment friendly refrigerants.
- **Air Conditioning:** Principle of air conditioning, requirements of comfort air conditioning. Psychrometric properties and their calculation. Different psychrometric processes. Psychrometric chart. Design of summer & winter air conditioning systems.

9. Renewable Energy Systems and Energy Storage

- **Solar Energy:** Solar radiation and its measurement. Flat plate and focusing collectors and its applications. Solar photovoltaic conversion. Latest trends, types, technologies and efficiencies of solar PV cells.
- **Wind Energy:** Forecasting and wind data measurement, wind energy conversion systems, Betz criteria.
- **Biomass Energy, Green Hydrogen & Fuel Cells:** Methods of energy conversion from biomass. Green hydrogen: concept, methods for generation, storage options. Fuel cells: working principle, types and its applications.
- **Electric Vehicles:** Basic elements, concepts and trends in EVs in India and worldwide.
- **Energy Storage:** Classifications of energy storage methods. Thermal energy storage. Recent trends, technologies and capacities in battery storage.

10. Computer Integrated Manufacturing, Mechatronics, Artificial Intelligence & Machine Learning

- **Computer Aided Design (CAD):** 2D and 3D drawing concepts. Geometric modelling. Drawing exchange formats. Beizier curve, B-spline curve.
- **Computer Aided Manufacturing (CAM):** NC and CNC machines, G & M codes, methods of part programming. CIM wheel.
- **Robotics:** Robot configurations, classification & specifications, notation, SCARA robot. Automated material handling and retrieval systems. FMS.
- **Mechatronics:** Basics of Microprocessors & Microcontrollers. Computer interfacing, Programmable Logic Controller (PLC). Sensors and Actuators, stepper motors. Types of control systems.
- **Artificial Intelligence (AI) and Machine Learning (ML):** AI analytics, Natural Language Processing (NLP), speech recognition, virtual agents. AI in real world problems solving. Machine learning algorithms and artificial neural network.



Electrical Engineering

1. **Electromagnetic:**
    - Fields Coulomb's Law, Electric Field Intensity, Electric Flux Density.
    - Gauss's Law, Divergence, Electric field and potential due to point, line, plane and spherical charge distributions.
    - Effect of dielectric medium, Capacitance of simple configurations.
    - Biot□Savart's law, Ampere's law, Curl, Faraday's law, Lorentz force.
    - Inductance, Magnetomotive force, Reluctance, Magnetic circuits, self and mutual inductance of simple configurations.
2. **Network Elements:**
    - Ideal voltage and current sources, dependent sources, R, L, C elements.
    - Network solution methods: KCL, KVL, Node and Mesh analysis.
    - Network Theorems: Thevenin's theorem, Norton's theorem, Superposition theorem and Maximum Power Transfer theorem.
    - Transient response of DC and AC networks, sinusoidal steady-state analysis, resonance, two port networks.
    - Balanced three phase circuits; star-delta transformation, complex power and power factor in AC circuits.
3. **Electrical and Electronic Measurements:**
    - Bridges and Potentiometers.
    - Measurement of voltage, current, power, energy and power factor.
    - Instrument transformers.
    - Digital voltmeters and multi-meters, Phase, Time and Frequency measurement, Oscilloscopes.
    - Error analysis.
4. **Analog and Digital Electronics:**
    - Characteristics and equivalent circuits for small and large signals concept for diode, bipolar junction transistor (BJT), junction gate field-effect transistor (JFET), and Metal-oxide semiconductor field-effect transistor(MOSFET), clipping, Clamping and rectifier circuits,
    - Biasing and bias stability. Amplifiers: Single and multi-stage, Differential, Operational, Feedback and Power.
    - Operational amplifier (OPAMP) circuits. Single-transistor and OPAMP configurations.

- Boolean algebra, Boolean function minimization, Logic gates, combinational circuits, Arithmetic circuits, Code converters, Multiplexers and decoders, Sequential circuit, Latches and flip flops, Counters, Shift registers, Comparators, Timers, Multivibrators, Sample and hold circuits, ADCs and DACs.
- 8-bit microprocessor 8085: Architecture, instructions set, memory interfacing and I/O, interrupts. Architecture of 8051 microcontroller.

5. **Signals and Systems:**
   - Representation of continuous and discrete time signals.
   - Shifting and scaling properties, sampling theorem.
   - Fourier series representation of continuous and discrete time periodic signals.
   - Applications of Fourier Transform for continuous and discrete time signals.
   - Laplace Transform and Z transform. R.M.S. value, average value calculation for any general periodic waveform.
6. **Control Systems:**
   - Mathematical model and representation of systems, Feedback principle, Transfer function and Signal flow graphs.
   - Transient and Steady□state analysis of linear time invariant systems.
   - Stability analysis using Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci.
   - Lag, Lead and Lead□Lag compensators.
   - P, PI and PID controllers.
7. **Electrical Machines:**
   - Single phase transformer: equivalent circuit, phasor diagram, opens circuit and short circuit tests, regulation and efficiency, transfarmer oil testing.
   - Three-phase transformers: connections, vector groups, parallel operation, Auto-transformer.
   - Electromechanical energy conversion principles; DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, speed control of dc motors.
   - Single and Three-phase induction machines: principle of operation, types, performance, torque-speed characteristics, no-load and blocked-rotor tests, equivalent circuit, starting and speed control.
   - Synchronous machines: cylindrical and salient pole machines, performance and characteristics, regulation and parallel operation of generators, starting of synchronous motors; Types of losses and efficiency calculations of electric machines.

8. **Power Systems:**

- Basic concepts of electrical power generation and distribution. AC and DC transmission concepts. Models and performance of transmission lines and cables.
- Economic Load Dispatch, Series and shunt compensation.
- Electric field distribution and insulators, Per□unit quantities, Bus admittance matrix.
- Gauss- Seidel and Newton-Raphson load flow methods, Voltage and Frequency control, Symmetrical components.
- Symmetrical and unsymmetrical fault analysis, Principles of over□current, differential, directional and distance protection, Circuit breakers, System stability concepts, Equal area criterion.

9. **Power Electronics:**

- Semiconductor power devices: Diode, Transistor, Silicon controlled rectifier (SCR), Triac, Gate turn-off thyristor (GTO), MOSFET and Insulated-gate bipolar transistor (IGBT).
- Triggering circuits. Gate driver circuits.
- Phase control rectifiers. Inverters and DC-DC converters.
- Bridge converters: Fully controlled and half controlled.
- Principles of AC and DC Drives .

10. **Special machines and Utilization of Electrical Energy:**

- Stepper motors, Brushless DC motors, Switched reluctance motors. Permanent magnet motors.
- Tariff: Desirable characteristics, types (flat rate, block rate, kVA, maximum demand and time of day tariff). Power factor: Disadvantage of low power factor, cause of low power factor and power factor correction.
- Rating and characteristic of traction motors, methods of electric braking-plugging rheostatic braking and regenerative braking. Speed-time curves.
- Advantages and methods of electric heating, resistance heating induction heating and dielectric heating, Electric furnaces, Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.
- Illumination: light, lumen, intensity, candle power, lamp efficiency, LED lights. The Electricity Act-2003 and Electrical safety regulation.

Syllabus for Agricultural Engineering

Unit - I Soil and Water Conservation Engineering

- Soil erosion:- Introduction, causes and types - geological and accelerated erosion, agents, factors affecting and effects of erosion.
- Water erosion:- Mechanics and forms - splash, sheet, rill, gully, ravine and stream bank erosion. Gullies - Classification, stages of development.
- Soil loss estimation:- Universal soil loss equation (USLE) and modified USLE. Rainfall erosivity - estimation by KE>25 and EI_{30} methods. Soil erodibility - topography, crop management and conservation practice factors.
- Measurement of soil erosion-Runoff plots, soil samplers. Water erosion control measures - agronomical measures - contour farming, strip cropping, conservation tillage and mulching.
- Engineering measures- Bunds and terraces. Bunds - contour and graded bunds - design and surplussing arrangements.
- Terraces - level and graded broad base terraces, bench terraces - planning, design and layout procedure, contour stonewall and trenching.
- Gully and ravine reclamation - principles of gully control - vegetative measures, temporary structures and diversion drains.
- Grassed waterways and design.
- Wind erosion- Factors affecting, mechanics, soil loss estimation and control measures - vegetative, mechanical measures, wind breaks and shelter belts and stabilization of sand dunes.
- Land capability classification. Rate of sedimentation, silt monitoring and storage loss in tanks.

Unit -II Water Harvesting and Soil Conservation Structures

- Water harvesting techniques - classification based on source, storage and use. Runoff harvesting - short-term and long-term techniques. Short- term harvesting techniques -
- Structures - farm ponds - dug-out and embankment reservoir types, tanks and subsurface dykes.
- Farm pond - components, site selection, design criteria, capacity, embankment, mechanical and emergency spillways, cost estimation and construction.
- Percolation pond - site selection, design and construction details. Design considerations of *nala* bunds.
- Soil erosion control structures - introduction, classification and functional requirements. Permanent structures for soil conservation and gully control - check dams.
- Drop, chute and drop inlet spillways – design requirements, planning for design, design procedures hydrologic, hydraulic and structural design and stability analysis.
- Hydraulic jump and its application.

- Drop spillway applicability, types - straight drop, box-type inlet spillways - description, functional use, advantages and disadvantages, straight apron and stilling basin outlet, structural components and functions.
- Chute spillway - description, components, energy dissipaters, design criteria of Saint Antony Falls (SAF) stilling basin and its limitations.
- Drop inlet spillway-description, functional use and design criteria.

Unit III Watershed Planning and Management

- Watershed - introduction and characteristics. Watershed development - problems and prospects, investigation, topographical survey, soil characteristics, vegetative cover, present land use practices and socio- economic factors.
- Watershed management – concept, objectives, factors affecting, watershed planning based on land capability classes, hydrologic data for watershed planning.
- Watershed codification, delineation and prioritization of watersheds -sediment yield index.
- Water budgeting in a watershed. Management measures - rainwater conservation technologies - *in-situ* and *ex-situ* storage, water harvesting and recycling.
- Dry farming techniques, inter-terrace and inter-bund land management.
- Integrated watershed management - concept, components, arable lands -agriculture and horticulture, non-arable lands - forestry, fishery and animal husbandry.
- Effect of cropping systems, land management and cultural practices on watershed hydrology.
- Watershed programme - execution, follow-up practices, maintenance, monitoring and evaluation.
- Participatory watershed management - role of watershed associations, user groups and self-help groups.
- Planning and formulation of project proposal for watershed management programme including cost-benefit analysis.

Unit-IV Irrigation and Drainage Engineering

- Measurement of irrigation water: - Weir, flumes and orifices and other methods: open channel water conveyance system: design and lining of irrigation field channels, on farm structures for water conveyance, control & distribution.
- Underground pipe conveyance system: components and design: land grading: criteria for land leveling, land leveling design methods, estimation of earth work.
- Soil water plant relationship: soil properties influencing irrigation management, soil water movement, infiltration, soil water potential, soil moisture characteristics, soil moisture constants.
- Measurement of soil moisture, moisture stress and plant response; water requirement of crops, concept of evapotranspiration (ET).
- Measurement and estimation of ET, water and irrigation requirement of crops. Depth of irrigation. frequency of irrigation, irrigation efficiencies;
- Surface methods of water application: border, check basin and furrow irrigation-adaptability, specification and design considerations.

- Water logging-causes and impacts; drainage, objectives of drainage.
- Surface drainage coefficient types of surface drainage, design of surface drains.
- Sub-surface drainage: purpose and benefits. Investigations of design parameters-hydraulic conductivity, drainable porosity, water table.
- Derivation of Hooghoudt's and Ernst's drain spacing equations; design of subsurface drainage system; drainage materials, drainage pipes, drain envelope; layout, construction and installation of drains.

Unit V-Ground water, wells and Pump

- Occurrence and movement of ground water; aquifer and its types; classification of wells, fully penetrating tubewells and open wells, familiarization of various types of bore wells; design of openwells.
- Groundwater exploration techniques; methods of drilling of wells: percussion, rotary, reverse rotary.
- Design of tubewell and gravel pack, installation of well screen, completion and development of well.
- Groundwater hydraulics-determination of aquifer parameters by different method such as Theis, Jacob and Chow's, Theis recovery method; well interference, multiple well systems.
- Estimation of ground water potential, quality of ground water; artificial groundwater recharge techniques; pumping systems: water lifting devices.
- Different types of pumps, classification of pumps, component parts of centrifugal pumps, priming
- Pump selection, installation and trouble shooting, performance curves, effect of speed on capacity, head and power.
- Effect of change of impeller dimensions on performance characteristics.
- Hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics.
- Deep well turbine pump and submersible pump.

Unit-VI Artificial Intelligence

- Foundation and history of artificial intelligent, problems and techniques -AI programming languages.
- Introduction to LISP and PROLOG-problem spaces and searches, blind search strategies.
- Breadth first- Depth first-heuristic search techniques Hill climbing: best first-A* algorithm AO* algorithm – game tree. Min max algorithms, game playing – alpha beta pruning. Knowledge representation issues, predicate logic.
- Logic programming, semantic nets-frames and inheritance, constraint propagation, representing knowledge usingrules, rules based deduction systems.
- Reasoning under uncertainty, review of probability.
- Baye's probabilistic interferences and Dempster shafer theory, Heuristic methods, symbolic reasoning under uncertainty.
- Statistical reasoning, Fuzzy reasoning, Temporal reasoning, Non monotonic reasoning.
- Planning and planning in situational calculus, representation for planning, partial order planning algorithm.

- Principles of Natural language processing, rule based systems architecture, Expert systems and knowledge acquisition concepts.
- AI application to robotics, and current trends in intelligent systems.

Unit-VII Farm Machinery and Equipment

- Calculation of field capacities and field efficiency. Calculations for economics of machinery usage, comparison of ownership with hiring of machines.
- Machines used for primary tillage, secondary tillage, rotary tillage, deep tillage and minimum tillage.
- Measurement of draft of tillage tools and calculations for power requirement for the tillage machines. Introduction to tillage machines like mould-board plough, disc plough, chisel plough, sub-soiler, harrows. Cultivators, Identification of major functional components.
- Sowing, planting & transplanting equipment. Introduction to seed drills. no-till drills, and strip-till drills. Introduction to planters, bed-planters and other planting equipment.
- Study of types of furrow openers and metering systems in drills and planters. Calibration of seed-drills/planters.
- Threshing systems -manual and mechanical systems. Types of threshing drums and their applications.
- Types of threshers- tangential and axial, their constructional details and cleaning systems.
- Study of straw combines -working principle and constructional details. Study of root crop diggers-principle of operation, blade adjustment and approach angle, and calculation of material handled.
- Study of potato and groundnut diggers.
- Study of maize harvesting combines. Introduction to vegetables and fruit harvesting equipment and tools.

Unit-VIII Tractor and Automotive Engine

- Study of sources of farm power-conventional & non-conventional energy sources. Classification of tractors and IC engines.
- Study of engine strokes and comparison of 2-stroke and 4-stroke engine cycles and CI and SI engines.
- Need of governors, governor types and governor characteristics. Study of need for transmission system in a tractor.
- Transmission system-types, major functional systems.
- Study of clutch -need, types, functional requirements, construction and principle of operation. Study of tractor power outlets-PTO. PTO standards, types and functional requirements.
- Traction. Traction terminology.
- Determination and importance of moment of inertia of a tractor. Study of tractor static equilibrium, tractor stability especially at turns.
- Determination of maximum drawbar pulls. Familiarization with tractor as aspring-mass system.
- Ergonomic considerations and operational safety.
- Tractor testing. Deciphering the engine test codes.

Unit-IX Precision Agriculture and Crop Residue Management

- Precision Agriculture- need and functional requirements.
- Familiarization with issues relating to natural resources.
- Familiarization with equipment for precision agriculture including sowing and planting machines.
- Power sprayers and land clearing machines.
- Laser guided land levellers, straw-chopper, straw-balers, grain Combines etc.
- GIS based precision agriculture and its applications.
- Sensors and application of sensors for data generation.
- Database management. System concept.
- System approach in farm Machinery management, problems on machinery selection.
- Concept of crop residue management.

Unit- X Post Harvest Technology & Food processing

- Processing of farm crops cereals, pulses, oil seeds, fruits and vegetables and their products for food and feed processing.
- Theory of mixing- types of mixtures for dry and paste materials, rate of mixing and power requirement, mixing index.
- Theory of separation, size and unsized separation, types of separators, size of screens, sieve analysis, capacity and effectiveness of screens pneumatic separation.
- Theory of filtration, study of different types of filters, rate of filtration pressure drop during filtration.
- Study of different types of material handling systems; belt chain and screw conveyor bucket elevator, pneumatic conveying.
- Moisture content and methods for determination, importance of EMC and methods of its determination, EMC curve and EMC model, principle of drying, theory of diffusion, mechanism of drying-falling rate, constant rate, thin layer and deep bed drying and their analysis.
- Critical moisture content, drying models, calculation of drying air temperature and air flow rate, air pressure within the grain bed. Shred's and Hukill's curve, different methods of drying including puff drying, foam mat drying, Freeze drying.
- Study of different types of dryers- performance,. Energy utilization pattern and efficiency study of drying and dehydration of agricultural products.
- Types and causes of spoilage in storage, conditions for storage of perishable product, functional requirement of storage, control of temperature and relative humidity inside storage. Modified atmospheric storage and control of its environment, air movement inside the storage.
- Storage condition for various fruits and vegetables under cold and CA storage system. Economic, aspects of storage.

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