

Factly Weekly

Compilation

2024

**For UPSC CSE Prelims
Exam**

**2nd Week
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UPSC Syllabus: Science and technology

INS Arighat

Why in News?

India is on the verge of commissioning its second nuclear-powered submarine, INS Arighat, **UPSC Syllabus: Science and technology**

equipped with nuclear missiles for strategic deterrence.

About INS Arighat



Figure 1 Source:TOI

Aspects	Description
About	<ol style="list-style-type: none">1. INS Arighat was commissioned into the Indian Navy on March 10, 2023.2. INS Arighat is India's second indigenously built nuclear-powered ballistic missile submarine (SSBN).3. The development of INS Arighat, along with its predecessor INS Arihant, is a part of India's effort to establish a credible nuclear triad, which includes land-based, air-based, and sea-based nuclear delivery systems.
Constructed by	The submarine was constructed at the Indian Navy's Ship Building Centre (SBC) in Visakhapatnam .
Significance	INS Arighat plays a crucial role in enhancing the nation's capability to launch nuclear missiles from land, air, and sea .

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Features	<ol style="list-style-type: none">1. INS Arighat has a submerged displacement of around 6,000 tons. The submarine is approximately 111 meters (364 feet) long and 11 meters (36 feet) wide.2. Propulsion: It is powered by a nuclear reactor which provides it with virtually unlimited range and endurance, allowing it to remain submerged for extended periods.3. Armament: INS Arighat is equipped with ballistic missiles capable of carrying nuclear warheads. The specific missiles include the K-15 Sagarika and potentially the K-4 missile, both designed to enhance the submarine's strategic strike capabilities.4. The submarine features advanced stealth technology to reduce its detectability by enemy sonar systems. Its design incorporates lessons learned from INS Arihant, improving its operational effectiveness and survivability.
Strategic Significance	<ol style="list-style-type: none">1. Nuclear Deterrence: INS Arighat plays a crucial role in India's nuclear triad which ensures a credible second-strike capability. This enhances India's ability to retaliate in the event of a nuclear attack, thereby maintaining a strong and secure deterrent posture.2. Patrols and Deployment: It operates primarily in the Indian Ocean ensuring India's nuclear deterrent is always at sea. Its deployment enhances regional security and contributes to India's strategic influence.

Collision Avoidance System (CAS)

Why in News?

Vehicular traffic is integral to modern life. With increasing demand and complexity, collision avoidance systems are essential for ensuring safety.

About Collision Avoidance System (CAS)

Aspects	Description
About	A Collision Avoidance System (CAS) is a safety technology designed to prevent or reduce the severity of collisions in vehicles, aircraft, ships, and other modes of transportation.
Key Components	<ol style="list-style-type: none">1. Sensors and Detection: CAS relies on a variety of sensors such as radar, lidar, ultrasonic sensors, and cameras to detect obstacles or other vehicles around the vehicle or aircraft.2. Processing Unit: The data from the sensors is processed by an onboard computer, which assesses the risk of collision by analyzing the speed, distance, and trajectory of the detected objects.3. Warning System: If the system determines that a collision is imminent, it alerts the driver or pilot through audible alarms, visual warnings, or haptic feedback (like vibrating the steering wheel or seat).4. Automatic Action: In advanced CAS, if the driver or pilot does not respond to the warnings, the system can take automatic actions such as applying the brakes, steering away from the obstacle, or adjusting speed to avoid a collision.

Types of CAS	<p>1. Automotive CAS: It involves forward Collision Warning (FCW), Automatic Emergency Braking (AEB), Lane Departure Warning (LDW) and blind Spot Detection (BSD).</p> <p>2. Aviation CAS: It includes Traffic Collision Avoidance System (TCAS) and Ground Proximity Warning System (GPWS).</p> <p>3. Marine CAS: It includes automatic Radar Plotting Aid (ARPA) which helps in detecting and tracking other vessels to avoid collisions at sea.</p>
Benefits	<p>1. Enhanced Safety: CAS significantly reduces the likelihood of accidents by providing early warnings and automatic interventions.</p> <p>2. Driver/Pilot Assistance: It aids in situations where human reaction time may be insufficient.</p> <p>3. Insurance and Liability: Vehicles and aircraft equipped with CAS may benefit from lower insurance premiums due to reduced risk.</p>
Challenges	<p>1. Sensor Limitations: The effectiveness of CAS can be hindered by poor weather conditions, sensor malfunction, or false positives.</p> <p>2. Driver/Pilot Over-reliance: There is a risk that drivers or pilots may become too dependent on the system and not remain vigilant.</p>
Future development	<p>Integration with Autonomous Systems: CAS is an essential component of fully autonomous vehicles, where collision avoidance will be entirely managed by the vehicle's systems.</p> <p>Improved Algorithms: Ongoing advancements in machine learning and AI are expected to enhance the accuracy and reliability of CAS.</p>

Lunisolar calendar

Why in News?

Recently, scientists have discovered what is believed to be the earliest known lunisolar calendar.

About the lunisolar calendar



Figure 2. Source: TOI

1. Site of the discovery: The calendar has been discovered at **Göbekli Tepe**. It is an ancient site in southern Turkey. The site is known for its temple-like enclosures, and this discovery adds to its significance as one of the most important archaeological sites in the world.

2. Significance of the Calendar: The calendar documents a significant astronomical event, a comet impact that occurred around

13,000 years ago. This event is believed to have had a profound effect on Earth, possibly triggering a 1,200-year ice age and leading to the extinction of many large animals.

3. Carvings on the Pillars: The pillars at Göbekli Tepe contain detailed carvings, including **V-shaped markings**. Scientists suggests that these carvings record the date and story of the comet fragments that struck Earth around 10,850 BC. The **V-shaped symbols are thought to represent days in a lunisolar calendar**.

4. Cultural and Historical Impact: The carvings suggest that ancient people were **capable of observing and recording the movements of the sun, moon, and constellations**, marking seasonal changes and significant events.

DDoS Attack on X

Why in News?

Elon Musk hosted an audio interview with Donald Trump on his platform, X. The interview faced a 40-minute delay and technical issues due to what Musk described as a “massive DDoS attack.”

About DDoS Attack

Aspects	Description
About	<ol style="list-style-type: none"> 1. A Distributed Denial-of-Service (DDoS) attack overwhelms a website or online service by flooding it with massive traffic, making it inaccessible to legitimate users. 2. Attackers typically use networks of compromised devices, known as botnets, to send excessive data to the target.
How DoS and DDoS Attacks Work?	<ol style="list-style-type: none"> 1. Botnets: Attackers deploy networks of compromised devices, known as botnets, to launch an attack by overwhelming a target with excessive traffic. 2. Smurf Attack: In this method, attackers send malicious Internet Control Message Protocol (ICMP) packets to multiple hosts using a spoofed source IP address. The targeted servers respond, inadvertently flooding their own network and causing a DDoS attack. 3. SYN Flood: Attackers initiate connection requests to a server but intentionally leave them incomplete. This results in multiple incomplete connections, overloading the server and preventing legitimate connections from being processed smoothly.
Signs	Slower internet speeds and difficulty accessing online services can indicate a DDoS(Distributed Denial-of-Service) attack.
Impact of DoS Attacks	<p>It can cause disruptions which can last from a few hours to days, affecting major websites and services.</p> <p>For example: In 2016, a similar attack disrupted sites like Spotify, Twitter, and Amazon for hours.</p> <p>Before the Paris Olympics, France faced a similar attack, disrupting state</p>

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	services and highlighting the potential severity of such attacks.
Prevention	Anti-virus software, firewalls, and security systems are essential for detecting and mitigating such attacks.

Model Solar Village Component of PM Surya Yojana

Why in News?

The Ministry of New and Renewable Energy recently notified the Scheme Guidelines for implementing the 'Model Solar Village' under PM-Surya Ghar: Muft Bijli Yojana.

About Model Solar Village

Aspects	Description
About	It is a key component under the PM-Surya Ghar: Muft Bijli Yojana to promote solar energy adoption across rural India.
Launched by	Ministry of New and Renewable Energy (MNRE)
Implementing Agency	1. The implementation of the 'Model Solar Village' scheme will be carried out by the State/UT Renewable Energy Development Agency . 2. The District Level Committee (DLC) will supervise the process to ensure the selected villages effectively transition to solar-powered communities.
Objective	The initiative aims to establish one Model Solar Village in each district across India . It will enable village communities to become self-reliant in meeting their energy needs through solar power.
Financial outlay	1. A total financial outlay of ₹800 crore has been allocated for the 'Model Solar Village' component. 2. Grant per Village: Each selected Model Solar Village will receive a central financial assistance grant of ₹1 crore .
Eligibility	1. Eligibility: To be eligible, a village must be a revenue village with a population of over 5,000, or 2,000 for special category states. 2. Competitive Mode: Villages will be selected through a competitive process . In this process, they are checked six months after being declared a potential candidate by the District Level Committee (DLC) that how much overall Distributed Renewable Energy (RE) capacity have they added. 3. Winning Criteria: The village with the highest RE capacity in each district will be declared the winner and will receive the ₹1 crore grant.

About PM-Surya Ghar: Muft Bijli Yojana

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1. PM-Surya Ghar: Muft Bijli Yojana was approved on **29th February 2024**.
2. **Scheme Objective:** The Yojana aims to increase the share of solar rooftop capacity and empower residential households to generate their own electricity.
3. **Focus:** The scheme focuses on harnessing solar energy by installing solar panels on residential rooftops.
4. This initiative is designed to promote renewable energy use, reduce electricity costs for households, and support environmental sustainability.

UPSC Syllabus: Schemes and programmes

Difference in use of nitrogen by rice varieties

Why in News?

Biotechnologists at Guru Gobind Singh Indraprastha University (GGU) in New Delhi have found significant differences in the nitrogen utilization efficiency among popular rice varieties in India.

Key Findings:

1. Researchers found a significant difference in how various rice varieties in India utilize nitrogen. Some varieties of rice are much more efficient than others.
2. **Significance:** This discovery **can lead to the development of new rice varieties** that require less nitrogen while maintaining high yields. The research emphasizes the need to focus on biotechnological methods to develop rice varieties with **improved Nitrogen Use Efficiency (NUE)**.

Importance of Nitrogen Use Efficiency (NUE):

1. Nitrogen-use efficiency **refers to the yield of a crop relative to the amount of nitrogen** (both natural and artificial) available to it.
2. Poor NUE in crops leads to a **massive waste of nitrogen fertilizers**, costing India ₹1 trillion annually and over \$170 billion globally.
3. **Environmental Concerns with Low NUE:** Nitrogen fertilizers are a major source of pollution. It contributes to harmful emissions like **nitrous oxide** and **ammonia**, as well as nitrate and ammonium contamination in water.

UPSC Syllabus: Defence exercise

Mitra Shakti Exercise 2024

Why in News?

Next week, the Indian Army and the Sri Lankan Army will commence the 10th edition of their joint exercise, "Mitra Shakti," at Maduruoya in Sri Lanka's Southern Province.

About Mitra Shakti Exercise



Figure 3.Source- PIB

Aspects	Description
About	<ol style="list-style-type: none"> 1. The 10th edition of the “Mitra Shakti” joint exercise will start on August 12, 2024, in Maduruoya, Sri Lanka. 2. This annual exercise is designed to improve cooperation and coordination between the Indian Army and the Sri Lankan Army.
Previous exercise	<ol style="list-style-type: none"> 1. The last exercise, the 9th edition, took place in Pune, India. 2. The focus included using drones, countering unmanned aerial systems, securing helipads, and casualty evacuations.
Participants	<ol style="list-style-type: none"> 1. Indian Army: A unit of 120 soldiers from the Rajputana Rifles (Raj Rif) will participate. 2. Sri Lankan Army: 120 soldiers from the Gajaba Regiment will join the exercise. Both units are elite infantry forces with specialized skills.
Main Focus	<ol style="list-style-type: none"> 1. The main focus is on joint operations in semi-urban environments. 2. The exercise aligns with Chapter VII of the United Nations Charter, which deals with maintaining international peace and security.
Objectives	<ol style="list-style-type: none"> 1. Enhance Skills: Improve the operational abilities of both armies through shared experiences and best practices. 2. Counter-terrorism and Urban Warfare: Train to handle modern security issues, including counter-terrorism and urban combat. 3. Strengthen Defence Ties: Boost coordination and strengthen military relations between India and Sri Lanka.
Significance	<ol style="list-style-type: none"> 1. Regional Stability: These joint exercises help maintain and promote stability in the region. 2. Collaborative Efforts: Both nations work together to address common security challenges and enhance readiness.

Exercise Udara Shakti 2024

Why in News?

Recently, the Indian Air Force (IAF) team returned to India after participating in Exercise Udara Shakti 2024 in Malaysia.

About Exercise Udara Shakti 2024



Source:PIB

Aspects	Description
About	<ol style="list-style-type: none">Exercise Udara Shakti 2024 was a joint air exercise conducted from August 5 to 9, 2024, in Kuantan, Malaysia.It was between the Indian Air Force (IAF) and the Royal Malaysian Air Force (RMAF).
Objective	The primary aim was to enhance interoperability and cooperation between the two air forces by sharing knowledge and learning from each other's experiences.
Participants	The IAF deployed Su-30MKI fighter jets , while the RMAF fielded Su-30MKM fighters, both of which are similar in design.
Training	<ol style="list-style-type: none">Pilots from both air forces engaged in air combat missions to better understand each other's operational tactics and procedures.This training aimed to improve their ability to work together in future joint operations.Technical experts from the IAF and RMAF participated in discussions focused on aircraft maintenance.

	4. They collaborated to identify best practices for maintaining their aircraft, enhancing readiness for future missions.
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UPSC Syllabus: Environment

Asceua tertia

Why in News?

Asceua tertia is a newly identified species of ground-dwelling spider, discovered in the Shendurney Wildlife Sanctuary. The Shendurney Wildlife Sanctuary is part of the Western Ghats in India.

About Asceua tertia



Source: TH

Aspects	Description
About	<ol style="list-style-type: none">1. The newly discovered Asceua tertia belongs to the genus Asceua, which is part of the ant-eating spider family Zodariidae.2. It is the third species of the Asceua genus to be documented in India
Characteristic features	<ol style="list-style-type: none">1. They are distinguished by their small size and compressed bulbs.2. Asceua tertia varies in size, with males measuring 2.54 mm and females 3.2 mm.

About Shendurney Wildlife Sanctuary

1. Shendurney Wildlife Sanctuary is a protected area located in the **Western Ghats of Kerala**, India. It was established in 1984.
2. It spans an area of approximately 171 square kilometers and is part of the **Agasthyamala Biosphere Reserve**.
3. It features a **mix of evergreen and deciduous forests**, along with rolling hills, streams, and rivers, creating a lush and diverse landscape.
4. The fauna of Shendurney Wildlife Sanctuary includes tigers, gaurs, elephants, sambar deer, sloth bears, as well as various butterfly species like the Malabar Raven, Malabar Banded Swallowtail, and Red-disc Bushbrown.

UPSC Syllabus: Indian Economy

Overnight Index Swap (OIS)

Why in News?

Recently, the Reserve Bank of India (RBI) has been reviewing the investment limit for foreign investors in the overnight index swap (OIS) market.

About Overnight Index Swap (OIS)

Aspects	Description
About	An OIS is a financial derivative that allows two parties to exchange a fixed interest rate for a floating rate linked to an overnight index.
Purpose	OIS contracts are used to manage interest rate exposure, ensure financial stability, and potentially profit from interest rate predictions.
Party involved	Fixed-Rate Payer: Pays a predetermined, constant interest rate throughout the swap's duration. Floating-Rate Payer: Pays a variable interest rate based on an overnight index, which fluctuates daily.
How it works	1. Notional Principal: The swap is based on a notional principal amount used to calculate interest payments, but this principal is not exchanged between the parties. 2. Interest Rate Payments: At the end of the swap's term, the parties exchange the difference between the fixed and floating interest payments. 3. Settlement: The party with the higher interest obligation compensates the other party for the net difference. 4. Examples include the Federal Reserve's federal funds rate (U.S.) and the European

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	Central Bank's EONIA rate (Eurozone).
Application	<ol style="list-style-type: none">Hedging: Financial institutions use OIS to protect against short-term interest rate fluctuations.Speculation: Traders may speculate on future interest rate movements to profit from the difference between fixed and floating rates.
Scenario in which it can be undertaken	A bank expecting an increase in short-term interest rates might enter an OIS to pay a fixed rate while receiving a floating rate, thus hedging against rising borrowing costs.
Advantages	<ol style="list-style-type: none">Lower Counterparty Risk: Only the net difference in interest payments is exchanged, reducing risk.Liquidity: OIS markets are typically liquid, making it easier to enter or exit positions.