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| Programme Name/s | : Architecture Assistantship/ Architecture and Interior Design/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Software Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Dress Designing & Garment Manufacturing/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical and Electronics Engineering/ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Hotel Management & Catering Technology/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Manufacturing Technology/ Medical Electronics/ Metallurgical Engineering/ Production Engineering/ Printing Technology/ Polymer Technology/ Surface Coating Technology/ Computer Science/ Textile Technology/ Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures |
| Programme Code | : AA/ AD/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CST/ CW/ DC/ DD/ DE/ DS/ EE/ EJ/ EK/ EP/ ET/ EX/ FC/ HA/ HM/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MRT/ MU/ MY/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TR/ TX |
| Semester | : Fourth / Sixth |
| Course Title | : ENVIRONMENTAL EDUCATION AND SUSTAINABILITY |
| Course Code | : 314301 |

I. RATIONALE

The survival of human beings is solely depending upon the nature. Thus, threats to the environment directly impact on existence and health of humans as well as other species. Depletion of natural resources and degradation of ecosystems is accelerated due to the growth in industrial development, population growth, and overall growth in production demand. To address these environmental issues, awareness and participation of individuals as well as society is necessary. Environmental education and sustainability provide an integrated, and interdisciplinary approach to study the environmental systems and sustainability approach to the diploma engineers.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Resolve the relevant environmental issue through sustainable solutions

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Identify the relevant Environmental issues in specified locality.
- CO2 - Provide the green solution to the relevant environmental problems.
- CO3 - Conduct SWOT analysis of biodiversity hotspot
- CO4 - Apply the relevant measures to mitigate the environmental pollution.
- CO5 - Implement the environmental policies under the relevant legal framework.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

ENVIRONMENTAL EDUCATION AND SUSTAINABILITY**Course Code : 314301**

| Course Code | Course Title | Abbr | Course Category/s | Learning Scheme | | | | | Credits | Paper Duration | Assessment Scheme | | | | | | | | | | Total Marks | |
|-------------|--------------------------------------------|------|-------------------|--------------------------|----|----|-----|-----|---------|----------------|-------------------|------------------|-------|-------|-----|-------------|-----|-------|-----|-----|-------------|-----|
| | | | | Actual Contact Hrs./Week | | | SLH | NLH | | | Theory | Based on LL & TL | | | | Based on SL | | | | | | |
| | | | | CL | TL | LL | | | | | | Practical | | | | SLA | | | | | | |
| | | | | | | | | | | | | FA-TH | SA-TH | Total | | FA-PR | | SA-PR | | SLA | | |
| | | | | | | | | | | | | | | Max | Max | Max | Min | Max | Min | Max | | Min |
| 314301 | ENVIRONMENTAL EDUCATION AND SUSTAINABILITY | EES | VEC | 3 | - | - | 1 | 4 | 2 | 1.5 | 30 | 70*# | 100 | 40 | - | - | - | - | 25 | 10 | 125 | |

Total IKS Hrs for Sem. : 2 Hrs

Abbreviations: CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 1 | <p>TLO 1.1 Explain the need of studying environment and its components.</p> <p>TLO 1.2 Investigate the impact of population growth and industrialization on the relevant environmental issues and suggest remedial solutions</p> <p>TLO 1.3 Explain the Concept of 5 R w.r.t. the given situation</p> <p>TLO 1.4 Elaborate the relevance of Sustainable Development Goals in managing the climate change</p> <p>TLO 1.5 Explain the concept of zero carbon-footprint with carbon credit</p> | <p>Unit - I Environment and climate change</p> <p>1.1 Environment and its components, Types of Environments, Need of environmental studies</p> <p>1.2 Environmental Issues- Climate change, Global warming, Acid rain, Ozone layer depletion, nuclear accidents. Effect of population growth and industrialization</p> <p>1.3 Concept of 5R, Individuals' participation in i) 5R policy, ii) segregation of waste, and iii) creating manure from domestic waste</p> <p>1.4 Impact of Climate change, Factors contributing to climate change, Concept of Sustainable development, Sustainable development Goals (SDGs), Action Plan on Climate Change in Indian perspectives</p> <p>1.5 Zero Carbon footprint for sustainable development, (IKS-Environment conservation in vedic and pre-vedic India)</p> | Lecture Using Chalk-Board Presentations |

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|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 2 | <p>TLO 2.1 Justify the importance of natural resources in sustainable development</p> <p>TLO 2.2 Explain the need of optimum use of natural resources to maintain the sustainability</p> <p>TLO 2.3 Differentiate between renewable and non-renewable sources of energy</p> <p>TLO 2.4 Suggest the relevant type of energy source as a green solution to environmental issues</p> | <p>Unit - II Sustainability and Renewable Resources</p> <p>2.1 Natural Resources: Types, importance, Causes and effects of depletion. (Forest Resources, Water Resources, Energy Resources, Land resources, Mineral resources), (IKS- Concepts of Panchmahabhuta)</p> <p>2.2 Impact of overexploitation of natural resources on the environment, optimum use of natural resources</p> <p>2.3 Energy forms (Renewable and non-renewable) such as Thermal energy, nuclear energy, Solar energy, Wind energy, Geothermal energy, Biomass energy, Hydropower energy, biofuel</p> <p>2.4 Green Solutions in the form of New Energy Sources such as Hydrogen energy, Ocean energy & Tidal energy</p> | Lecture Using Chalk-Board Presentations |
| 3 | <p>TLO 3.1 Explain the characteristics and functions of ecosystem</p> <p>TLO 3.2 Relate the importance of biodiversity and its loss in the environmental sustainability</p> <p>TLO 3.3 Describe biodiversity assessment initiatives in India</p> <p>TLO 3.4 Conduct the SWOT analysis of the biodiversity hot spot in India</p> <p>TLO 3.5 Explain the need of conservation of biodiversity in the given situation</p> | <p>Unit - III Ecosystem and Biodiversity</p> <p>3.1 Ecosystem - Definition, Aspects of ecosystem, Division of ecosystem, General characteristics of ecosystem, Functions of ecosystem</p> <p>3.2 Biodiversity - Definitions, Levels, Value, and loss of biodiversity</p> <p>3.3 Biodiversity Assessment Initiatives in India</p> <p>3.4 SWOT analysis of biodiversity hot spot in India</p> <p>3.5 Conservations of biodiversity - objects, and laws for conservation of biodiversity</p> | Lecture Using Chalk-Board Presentations Video Demonstrations |
| 4 | <p>TLO 4.1 Classify the pollution based on the given criteria</p> <p>TLO 4.2 Justify the need of preserving soil as a resource along with the preservation techniques</p> <p>TLO 4.3 Maintain the quality of water in the given location using relevant preventive measures</p> <p>TLO 4.4 State the significance of controlling the air pollution to maintain its ambient quality norms</p> <p>TLO 4.5 Compare the noise level from different zones of city with justification</p> <p>TLO 4.6 Describe the roles and responsibilities of central and state pollution control board</p> | <p>Unit - IV Environmental Pollution</p> <p>4.1 Definition of pollution, types- Natural & Artificial (Man- made)</p> <p>4.2 Soil / Land Pollution – Need of preservation of soil resource, Causes and effects on environment and lives, preventive measures, Soil conservation</p> <p>4.3 Water Pollution - sources of water pollution, effects on environment and lives, preventive measures, BIS water quality standards for domestic potable water, water conservation</p> <p>4.4 Air pollution - Causes, effects, prevention, CPCB norms of ambient air quality in residential area</p> <p>4.5 Noise pollution - Sources, effects, prevention, noise levels at various zones of the city</p> <p>4.6 Pollution Control Boards at Central and State Government level: Norms, Roles and Responsibilities</p> | Lecture Using Chalk-Board Presentations |

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|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| 5 | TLO 5.1 Explain Constitutional provisions related to environmental protection TLO 5.2 Explain importance of public participation (PPP) in enacting the relevant laws TLO 5.3 Use the relevant green technologies to provide sustainable solutions of an environmental problem TLO 5.4 Explain the role of information technology in environment protection | Unit - V Environmental legislation and sustainable practices 5.1 Article (48-A) and (51-A (g)) of Indian Constitution regarding environment, Environmental protection and prevention acts 5.2 Public awareness about environment. Need of public awareness and individuals' participation. Role of NGOs 5.3 Green technologies like solar desalination, green architecture, vertical farming and hydroponics, electric vehicles, plant-based packaging 5.4 Role of information technology in environment protection and human health | Lecture Using Chalk-Board Presentations Video Demonstrations |

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES : NOT APPLICABLE.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Assignment

- Suggest the steps to implement (or improve the implementation) of the 5R policy in your home/institute stating your contribution
- Draft an article on India's Strategies to progress across the Sustainable Development Goals
- Make a chart of Renewable and non-renewable energy sources mentioning the advantages and disadvantages of each source
- Conduct the SWOT analysis of biodiversity hotspot in India
- Prepare a mind-mapping for the zero carbon footprint process of your field
- Prepare a chart showing sources of pollution (air/water/ soil), its effect on human beings, and remedial actions
- Any other assignment on relevant topic related to the course suggested by the facilitator

UNICEF Certification(s)

- Students may complete the self-paced course launched by Youth Leadership for climate Exchange under UNICEF program on portal www.mahayouthnet.in. The course encompasses five Modules in the form of Units as given below:
 - Unit 1: Living with climate change
 - Unit 2 : Water Management and Climate Action
 - Unit 3: Energy Management and Climate Action
 - Unit 4 : Waste Management and Climate Action
 - Unit 5 : Bio-cultural Diversity and Climate Action
- If students complete all the five Units they are not required to undertake any other assignment /Microproject/activities specified in the course. These units will suffice to their evaluations under SLA component

Micro project

- Technical analysis of nearby commercial RO plant.
- Comparative study of different filters used in Household water filtration unit
- Evaluate any nearby biogas plant / vermicomposting plant or any such composting unit on the basis of sustainability and cost-benefit
- IKS-Study and prepare a note on Vedic and Pre-Vedic techniques of environmental conservation

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Visit a local polluted water source and make a report mentioning causes of pollution

Any other activity / relevant topic related to the course suggested by the facilitator

Activities

- Prepare a report on the working and functions of the PUC Center machines and its relevance in pollution control.
- Prepare and analyse a case study on any polluted city of India
- Prepare a note based on the field visit to the solid waste management department of the municipal corporation / local authority
- Record the biodiversity of your institute/garden in your city mentioning types of vegetation and their numbers
- Visit any functional hall/cultural hall /community hall to study the disposal techniques of kitchen waste and prepare a report suggesting sustainable waste management tool
- Watch a video related to air pollution in India and present the summary
- Any other assignment on relevant topic related to the course suggested by the facilitator

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicious mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

| Sr.No | Equipment Name with Broad Specifications | Relevant LLO Number |
|-------|------------------------------------------|---------------------|
| 1 | Nil | All |

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

| Sr.No | Unit | Unit Title | Aligned COs | Learning Hours | R-Level | U-Level | A-Level | Total Marks |
|--------------------|------|-----------------------------------------------------|-------------|----------------|-----------|-----------|-----------|-------------|
| 1 | I | Environment and climate change | CO1 | 8 | 4 | 4 | 4 | 12 |
| 2 | II | Sustainability and Renewable Resources | CO2 | 10 | 4 | 4 | 8 | 16 |
| 3 | III | Ecosystem and Biodiversity | CO3 | 8 | 4 | 4 | 4 | 12 |
| 4 | IV | Environmental Pollution | CO4 | 12 | 4 | 8 | 6 | 18 |
| 5 | V | Environmental legislation and sustainable practices | CO5 | 7 | 4 | 4 | 4 | 12 |
| Grand Total | | | | 45 | 20 | 24 | 26 | 70 |

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Two-unit tests (MCQs) of 30 marks will be conducted and average of two-unit tests considered. Formative assessment of self learning of 25 marks should be assessed based on self learning activity such as UNICEF Certification(s)/Microproject/assignment/activities. (60 % weightage to process and 40 % to product)

Summative Assessment (Assessment of Learning)

- Online MCQ type Exam

XI. SUGGESTED COS - POS MATRIX FORM

| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | | | Programme Specific Outcomes* (PSOs) | | |
|-----------------------|----------------------------------------------|-----------------------|---------------------------------------|------------------------|------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------------------|-------|-------|
| | PO-1 Basic and Discipline Specific Knowledge | PO-2 Problem Analysis | PO-3 Design/ Development of Solutions | PO-4 Engineering Tools | PO-5 Engineering Practices for Society, Sustainability and Environment | PO-6 Project Management | PO-7 Life Long Learning | PSO-1 | PSO-2 | PSO-3 |
| CO1 | - | 1 | - | - | 3 | 2 | 3 | | | |
| CO2 | - | 2 | 2 | - | 3 | 2 | 3 | | | |
| CO3 | - | - | - | - | 3 | 1 | 2 | | | |
| CO4 | 1 | - | - | - | 3 | 2 | 2 | | | |
| CO5 | 1 | - | 2 | - | 3 | 2 | 3 | | | |

Legends :- High:03, Medium:02, Low:01, No Mapping: -
 *PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

| Sr.No | Author | Title | Publisher with ISBN Number |
|-------|----------------|---------------------------------------------|---------------------------------------------------------------|
| 1 | Y. K. Singh | Environmental Science | New Age International Publishers, 2006, ISBN: 81-224-2330-2 |
| 2 | Erach Bharucha | Environmental Studies | University Grants Commission, New Delhi |
| 3 | Rajagopalan R. | Environmental Studies: From Crisis to Cure. | Oxford University Press, USA, ISBN: 9780199459759, 0199459754 |
| 4 | Shashi Chawla | A text book of Environmental Science | Tata Mc Graw-Hill New Delhi |
| 5 | Arvind Kumar | A Text Book of Environmental science | APH Publishing New Delhi (ISBN 978-8176485906) |

XIII. LEARNING WEBSITES & PORTALS

| Sr.No | Link / Portal | Description |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | https://sdgs.un.org/goals | United Nation's website mentioning Sustainability goals |
| 2 | http://www.greenbeltmovement.org/news-and-events/blog | Green Belt Movement Blogs on various climatic changes and other issues |
| 3 | http://www.greenbeltmovement.org/what-we-do/tree-planting-for-watersheds | Green Belt Movement's work on tree plantation, soil conservation and watershed management techniques |
| 4 | https://www.youtube.com/@ierekcompany/videos | International Experts For Research Enrichment and Knowledge Exchange – IEREK's platform to exchange the knowledge in fields such as architecture, urban planning, sustainability |
| 5 | www.mahayouthnet.in | UNICEF Initiative for youth leadership for climate action |

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| Sr.No | Link / Portal | Description |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 6 | https://eepmoefcc.nic.in/index1.aspx?lsid=297&lev=2&lid=1180&langid=1 | GOI Website for public awareness on environmental issues |
| 7 | https://egyankosh.ac.in/handle/123456789/61136 | IGNOU's Initiative for online study material on Environmental studies |
| 8 | https://egyankosh.ac.in/handle/123456789/50898 | IGNOU's Initiative for online study material on sustainability |
| 9 | https://sustainabledevelopment.un.org/content/documents/11803Official-List-of-Proposed-SDG-Indicators.pdf | Final list of proposed Sustainable Development Goal indicators |
| 10 | https://sustainabledevelopment.un.org/memberstates/india | India's Strategies to progress across the SDGs. |
| 11 | https://www.un.org/en/development/desa/financial-crisis/sustainable-development.html | Challenges to Sustainable Development |
| 12 | https://nptel.ac.in/courses/109105190 | NPTEL course on sustainable development |
| 13 | https://onlinecourses.swayam2.ac.in/cec19_bt03/preview | Swayam Course on Environmental studies (Natural Resources, Biodiversity and other topics) |
| 14 | https://onlinecourses.nptel.ac.in/noc23_hs155/preview | NPTEL course on environmental studies which encompasses SDGs, Pollution, Climate issues, Energy, Policies and legal framework |
| 15 | https://www.cbd.int/development/meetings/egmbped/SWOT-analysis-en.pdf | SWOT analysis of Biodiversity |
| 16 | https://www.sanskrit.nic.in/SVimarsha/V2/c17.pdf | Central Sanskrit University publication on Vedic and pre Vedic environmental conservation |
| Note : <ul style="list-style-type: none"> Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students | | |

MSBTE Approval Dt. 21/11/2024**Semester - 4 / 6, K Scheme**