1.3.1: Institution integrates cross-cutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability, and Human Values into the curriculum

List of Courses

S.No	Course Code	Course Title
1	21CE502	Environmental Engineering
2	21CE002	Air Pollution and Environmental Impact Assessment
3	21CE003	Solid Waste Management
4	21CE019	Green Buildings
5	21EE002	Renewable Energy Sources
6	21EE017	Sustainable Energy
7	21ME005	Alternate fuels and Emission controls in Automotives
8	21ME002	Principles of Entrepreneurship
9	21MEC33	Quality Assurance & Reliability Engineering for Sustainability
10	21ATX01	Environmental Studies
11	21ATX02	Professional Ethics and Human Values
12	21ATX03	Design The Thinking
13	21AT004	Ethics and Integrity
14	21AT005	Indian Heritage and Culture
15	21AT006	Intellectual Property Rights and Patents
16	21AT008	Introduction to Journalism
17	21AT009	Mass Media Communication
18	21AT010	Social Responsibility
19	21AT011	The Art of Photography and Film Making
20	21AT012	Gender Equality for Sustainability
21	21AT013	Women in Leadership
22	21AT015	Climate Changes and Circular Economy

Description of Courses

S.No	Course Code	Course Name	Description
1	21CE502	Environmental Engineering	This course introduces the fundamental concepts of water supply and wastewater treatment systems, covering design of treatment units, sewage management, sludge disposal, and advanced processes like membrane filtration and sequencing batch reactors. It emphasizes sustainable engineering practices that ensure safe water, effective sanitation, and protection of natural water bodies, along with exposure to modern environmental technologies and standards.

2	21CE002	Air Pollution and Environmental Impact Assessment	This course focused on air quality management and explores sources and effects of air and noise pollution, sampling methods, and control technologies like electrostatic precipitators and scrubbers. It also provides an in-depth understanding of Environmental Impact Assessment (EIA), its legal framework, methodologies such as checklists and matrices, and preparation of environmental management plans, reinforced through case studies of infrastructure projects.
3	21CE003	Solid Waste Management	The course covers the entire cycle of municipal and hazardous waste management, from generation and collection to processing, treatment, and safe disposal. It highlights composting, biomethanation, sanitary landfills, and emerging waste-to-energy technologies while addressing the environmental and public health impacts of poor waste management. Hazardous waste categories such as nuclear, e-waste, and biomedical waste are also analyzed within the Indian regulatory context.
4	21CE019	Green Buildings	This course explores sustainable building design through eco-friendly materials, energy-efficient technologies, water conservation systems, and renewable energy integration. It discusses rating systems like LEED and GRIHA, passive energy strategies, and case studies of solar-powered buildings in India. Students gain knowledge on green construction practices that minimize environmental impact while enhancing comfort, efficiency, and long-term sustainability.
5	21EE002	Renewable Energy Sources	This course provides a comprehensive overview of sustainable energy technologies like solar, wind, and hydro power. Students learn about their design, implementation, and impact on environmental sustainability, preparing them for careers in the burgeoning renewable energy sector. The course provides theoretical knowledge to equip students with the skills needed to address global energy challenges.
6	21EE017	Sustainable Energy	The course addresses the pressing challenges of energy sustainability in the 21st century, including conservation, efficiency, and environmental impact. It provides methods to estimate fossil, nuclear, and renewable resources, along with thermodynamic analysis of energy conversion processes. Students explore how energy systems affect local, regional, and global environments, including climate change, while examining strategies to balance technological performance with ecological and economic sustainability.

7	21ME005	Alternate fuels and Emission controls in Automotives	This course explores the use of alternative fuels like alcohol, biodiesel, hydrogen, biogas, LPG, and CNG in internal combustion engines, along with solar and electric vehicles. It also focuses on emission measurement techniques and modern control technologies, including catalytic converters and exhaust gas recirculation. Students learn to evaluate the environmental impacts of automotive emissions while exploring sustainable mobility solutions.
8	21ME002	Principles of Entrepreneurship	The course develops entrepreneurial competencies by covering idea generation, business plan preparation, venture financing, and new venture management. It highlights the role of entrepreneurship in economic development, social responsibility, and innovation, while also addressing challenges such as marketing, e-commerce, and institutional support. Special emphasis is placed on opportunities for women entrepreneurs and start-up ecosystems in India.
9	21MEC33	Quality Assurance & Reliability Engineering for Sustainability	This course integrates statistical quality control with reliability engineering to ensure sustainable system design. It introduces concepts like acceptance sampling, failure rate modeling, FMEA, and fault tree analysis, while also addressing the sustainability dimension of quality assurance. Students gain practical skills in designing reliable systems that minimize failures, reduce risks, and meet long-term environmental and performance goals.
10	21ATX01	Environmental Studies	This course raises awareness of environmental challenges by exploring natural resources, ecosystems, biodiversity, pollution, and human population impacts. It introduces environmental laws, sustainable practices, and case studies, encouraging students to take personal and professional responsibility for environmental conservation. The interdisciplinary approach links science, ethics, and social responsibility to real-world environmental issues.
11	21ATX02	Professional Ethics and Human Values	Focused on ethical principles in professional life, this course covers human values, professional responsibilities, and global ethical dilemmas. Students examine case studies of integrity, loyalty, confidentiality, and conflicts of interest while understanding the role of ethics in engineering, globalization, and intellectual property. It equips future professionals to make responsible, ethical decisions in complex situations.
12	21AT003	Design The Thinking	This course nurtures creativity and innovation by teaching structured design processes such as four-step and twelve-step models,

			brainstorming, lateral thinking, and reverse engineering. It emphasizes practical applications through group activities, and case studies. Preparing students to translate design ideas into sustainable and user-centered solutions.
13	21AT004	Ethics and Integrity	The course highlights the importance of ethical conduct, emotional intelligence, and risk management in professional and public domains. It explores human values, leadership, and corporate social responsibility, while addressing issues like discrimination, safety, intellectual property, and governance. Students are encouraged to adopt integrity-driven practices for personal growth and organizational success.
14	21AT005	Indian Heritage and Culture	This course traces India's cultural evolution from Harappan and Vedic traditions to modern influences, highlighting contributions of dynasties, religions, art, and literature. It examines cultural movements such as Bhakti, Sufi, and Renaissance, while also analyzing social reform, nationalism, and ethical values from Indian epics and philosophies. Students gain an appreciation of India's unity in diversity and its role in shaping modern society.
15	21AT006	Intellectual Property Rights and Patents	his course introduces the fundamentals of IPR, including trademarks, copyrights, patents, and trade secrets, with a focus on legal processes, protection, and global frameworks. It emphasizes the role of intellectual property in fostering innovation, entrepreneurship, and technology transfer, while addressing ethical and legal issues. Students gain a practical understanding of safeguarding creative and technical ideas.
16	21AT008	Introduction to Journalism	The course covers the basics of news writing, journalism history, language of media, and responsibilities toward society. Students learn about news processes, clear writing techniques, ethical reporting, and emerging trends in print, broadcast, and online journalism. It equips them to critically analyze media practices and engage with journalism as a professional field.
17	21AT009	Mass Media Communication	This course examines the history, growth, and theories of mass communication, media laws and ethics, and the cultural impact of global media. It also covers media management, ICT applications, digital production, and social media's role in shaping public opinion. Students gain an understanding of media as a powerful social institution and communication tool.
18	21AT010	Social Responsibility	The course explores concepts of corporate social responsibility, sustainability, and stakeholder management at national and global levels. It

			highlights international frameworks like SDGs and Indian CSR practices, alongside case studies of successful initiatives. Students learn to evaluate social, environmental, and economic responsibilities of individuals, corporations, and governments.
19	21AT011	The Art of Photography and Film Making	This course develops creative and technical skills in photography and cinematography, covering cameras, lenses, lighting, editing, and digital tools. It also explores the history of Indian cinema and visual storytelling techniques, giving students practical exposure to give importance to human values.
20	21AT012	Gender Equality for Sustainability	Linking gender equality to sustainable development, this course examines women's roles in health, governance, economy, and environment. It discusses case studies, policies, and empowerment strategies, showing how gender inclusiveness accelerates social, economic, and ecological sustainability. Students explore SDG 5 and its integration with other global goals..
21	21AT013	Women in Leadership	This course explores the role of women in leadership across education, society, sports, and entrepreneurship. It addresses barriers to empowerment, cultural dynamics, and inspiring case studies of women leaders. Students analyze challenges and opportunities in promoting gender equity and leadership at multiple levels.
22	21AT015	Climate Changes and Circular Economy	The course examines climate science, greenhouse effects, global circulation systems, and human-induced climate change, while introducing circular economy concepts such as zero waste, sustainable production, and life cycle analysis. Students learn about circular business models, policies, and frameworks for creating an economy that balances development with ecological preservation.

Syllabus

21CE502 Environmental Engineering

Unit I

Water Demand and Quality

Water Demand: Public water supply system, Planning, Objectives, Design period, Population forecasting; Water demand. Water Quality: Development and selection of source, Sources of water, Characteristics of water, Significance, Drinking Water quality standards; intake structures, Functions.

Laying, jointing and testing of pipes; appurtenances

Unit II

Design of Water Treatment Units

Objectives, Unit operations and processes, Principles, functions, design of water treatment plant units; aerators, flash mixers, Coagulation and flocculation, Clariflocculator, Plate and tube settlers; sand filters; Disinfection; Residue Management; Water softening, Construction, Operation and Maintenance aspects.

Desalination Process; Membrane Filtration

Unit III

Sewage Quality and Design of Sewage Treatment Units

Objectives, Unit Operations and Processes, Selection of treatment processes, Onsite sanitation, - Septic tank, - Grey water harvesting, Primary treatment: Principles, functions and design of sewage treatment units, Screens, Grit Chamber, Primary Sedimentation tanks, Construction, Operation and Maintenance aspects. Secondary Treatment: Activated Sludge Process and Extended aeration systems, Trickling filters, Sequencing Batch Reactor (SBR), Membrane Bioreactor, UASB, Waste Stabilization Ponds, Other treatment methods, Reclamation and Reuse of sewage, Recent Advances in Sewage Treatment.

Construction, Operation and Maintenance aspects; Sewer Appurtenances

Unit IV

Design of Ponds and Sludge Disposal

Effluent Disposal: Standards for Disposal, Methods, dilution, Self-purification of river, Oxygen sag curve, deoxygenation and reaeration, Streeter–Phelps model, Land disposal of Sewage. Sludge Disposal: Sludge characterization, Thickening, Sludge digestion, Standard rate and High rate digester design, Biogas recovery, Sludge Conditioning and Dewatering, Sludge drying beds.

Ultimate residue disposal and recent advances; Soil Dispersion System.

Text Book (s)

1. B.C. Punmia, Ashok Jain &Arun Jain, Water Supply Engineering, Vol. 1, Wastewater Engineering, Vol. II, 2nd Ed., Laxmi Publications Pvt. Ltd, New Delhi, 2016
2. G.S. Birdi, Water supply and Sanitary Engineering, Revised Ed., Dhanpat Rai & Sons Publishers, 2015
3. 3. K.N. Duggal, Elements of Environmental Engineering, 3rd Ed., S. Chand Publishers,2010

Reference Books (s)

1. Manual on Sewerage and Sewage Treatment Systems Part A, B and C, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
2. Metcalf and Eddy- Wastewater Engineering–Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2010.
3. Syed R. Qasim "Wastewater Treatment Plants", CRC Press, Washington D.C., 2010
4. Gray N.F, "Water Technology", Elsevier India Pvt. Ltd., New Delhi, 2006.

21CE002 Air Pollution and Environmental Impact Assessment

Unit I

Sources and Effects of Air Pollution

Classification of Air pollutants, Particulates and gaseous pollutants, effects of air pollution on human being, materials, animals and vegetation; global warming- ozone layer depletion, sampling and analysis, basic principle of sampling, source of ambient sampling, analysis of pollutants, principles

Sampling of air Pollutants; Ambient air quality standards.

Unit II

Air Pollution Control and Noise Pollution

Air Pollution Control: Particulate control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation- selection criteria for equipment- gaseous pollutant control by adsorption, absorption, condensation, combustion. Noise Pollution**:** Sources, Effects, Assessments, Standards and Control Methods, Prevention Methods.

Plume rise behavior ;Measurement of Noise level.

Unit III

Environmental Impact Assessment

Impacts of Development on Environment, Environmental Impact Assessment (EIA): Objectives, Historical development, EIA Types, EIA Notification and Legal Framework, Stakeholders and their Role in EIA. Screening and Scoping in EIA: Drafting of Terms of Reference, Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna EIA Methods- Matrices – Networks – Checklist Methods.

Rio Principles of Sustainable Development; Mathematical models for Impact prediction.

Unit IV

Environmental Management Plan

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna, Environmental Monitoring Plan, EIA Report Preparation, Review of EIA Reports, and Environmental Clearance.

Case Studies**:** EIA case studies pertaining to Infrastructure Projects, Roads and Bridges, Ports and Harbor, Airports, Dams and Irrigation projects, Power plants, CETPs.

Public Hearing; Post Project Monitoring.

Text book (s)

1. M. N. Rao and H. V. N. Rao, Air pollution, Tata McGraw-Hill, New Delhi, 1993 2. N
2. D. Nevers, Air Pollution Control Engineering, McGraw-Hill International Ed., 1993
3. Canter, R.L, "Environmental impact Assessment ", 2nd Edition, McGraw Hill Inc, New Delhi, 1995.
4. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu, "Environmental Impact Assessment for Developing Countries in Asia", Volume 1 – Overview, Asian Development Bank,1997.
5. Peter Morris, Riki Therivel "Methods of Environmental Impact Assessment", Routledge Publishers,2009

Reference (s)

1. K. Wark, C. F. Warner, Air Pollution, Its Origin and Control, Harper and Row, New York, 1981
2. C. S. Rao, Environmental Pollution Control Engineering, New Age International, 2005
3. Becker H. A., Frank Vanclay, "The International handbook of social impact assessment" conceptual and methodological advances, Edward Elgar Publishing, 2003.
4. Barry Sadler and Mary McCabe, "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme, 2002.
5. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I and II", Blackwell Science New York, 1998.
6. Ministry of Environment and Forests EIA Notification and Sectoral Guides, Government of India, New Delhi, 2010.

21CE003 Solid Waste Management

Unit I

Basics of Solid Waste

Sources and types of municipal solid waste – Waste generation rates – Factors affecting generation, composition, characteristics – Methods of sampling – Effects of improper disposal of solid wastes – Public health and environmental effects – Elements of solid waste management – Municipal solid waste rules – Role of NGO's, EPA

Unit II

Source Reduction, Storage, Collection and Transfer

Source Reduction and Storage: Source reduction of waste – Reduction, Reuse, Recycling and Recover – Segregation of wastes at source – Onsite storage methods – Materials used for containers.

Collection and Transfer: Methods of Collection – types of vehicles – Vehicle time management - Manpower requirement – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions

Unit III

Processing and Waste Disposal

Processing: Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and biomethanation; Thermal processing options.

Disposal: Land disposal of solid waste- Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas – Landfill bioreactor – Dumpsite Rehabilitation.

Unit IV

Hazardous Waste Management

Basics of Hazardous Waste: Need for hazardous waste management – Sources of hazardous wastes- Characteristics of Hazardous Waste- Effects on community – Basic Terminology and classification – Storage and collection of hazardous wastes.

Types of Hazardous Waste: Types, Classification, Handling, Storage and Disposal of Nuclear Waste, e-Waste, Biomedical waste and Chemical Waste.

Textbook (s)

1. George Tchobanoglous and Frank Kreith., "Handbook of Solid waste management", McGraw Hill, New York, 2002
2. John Pitchel., "Waste Management Practices-Municipal, Hazardous and industrial", CRC Press, Taylor and Francis, New York, 2014

Reference (s)

1. CPHEEO, "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation", Government of India, New Delhi, 2014
2. William, A. Worrell., P. Aarne Vesilind., "Solid Waste Engineering", Cengage Learning, 2012
3. Ramachandra, T. V., "Management of Municipal Solid Waste", TERI Press, New Delhi, 2009
4. Marc J. Rogoff and Francois Screve., "Waste to Energy Technologies and Project Implementation", Second Edition, Noyes Publication, USA, 2011

21CE019 Green Buildings

Unit I

Green Buildings

Definition of Green Buildings, typical features of green buildings, benefits of Green Buildings, Green building Principles, Sustainable site selection and planning of buildings to maximize comfort, day lighting, ventilation, planning for storm water drainage

Smart Buildings, technologies

Unit II

Environmentally Friendly Building Materials and Technologies

Natural Materials like bamboo, timber, rammed earth, stabilized mud blocks, hollow blocks, lime & lime pozzolana cements, materials from agro and industrial waste, ferro-cement, alternative roofing systems, various paints reducing the heat gain of the building, etc.

Ferro Concrete, bamboo as a construction material

Unit III

Energy and Resource Conservation and Use of Renewable Energy Resources

Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings-water harvesting in buildings – waste to energy management in residential complexes or gated communities. Wind and Solar Energy Harvesting.

Case studies of fully solar energy-based buildings in India

Unit IV

Building Resources and Green Building Rating Systems

Passive energy system design, Building envelope, orientation and components of building fabric and shading, Construction of curtain walls, Sourcing and recycling of building materials. Introduction to Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment – Modular wastewater treatment systems for built environment.

Building management systems, LEED certification

Textbook (s)

1. K.S.Jagadish, B. U. Venkataramareddy, K. S. Nanjundarao, Alternative Building Materials and Technologies, 2nd Ed., New Age International, 2007
2. Osman Attmann, Green Architecture Advanced Technologies and Materials, McGraw Hill, 2010

Reference (s)

1. Kibert, C. J, Sustainable Construction:Green Building Design and Delivery, 3 rd Ed., John Wiley & Sons, Inc., 2012
2. G. D. Rai, Non-Conventional Energy Resources,6th Ed., Khanna Publishers.1988
3. Greening Building – Green Congress, US. (Web).
4. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

21EE002 Renewable Energy Sources

Unit I

Introduction & Solar Energy

Introduction to renewable energy, advantages of generating power through renewable energy sources – technical & economical, Solar Energy: Physics of sun, the solar constant, extra-terrestrial and terrestrial solar radiation, instruments for measuring solar radiation and sun shine. Flat Plate and Concentrating Collectors, classification of concentrating collectors, thermal analysis of flat plate collectors, Photo voltaic energy conversion, PV cell model and characteristics, Maximum power point tracking for photovoltaic power systems. Types of Maximum power point tracking methods Perturb and Observe.

Solar applications-solar heating /cooling technique

Unit II

Wind & Bio-Mass Energy

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria, Maximum power generation. Principles of Bio-Conversion, Anaerobic/aerobic digestion, Types of Bio-Gas Digesters, gas yield, Combustion characteristics of bio-gas.

Utilization for cooking, IC Engine operation

Unit III

Geothermal & Ocean Energy

Types of Resources (hydrothermal, geo-pressured, hot dry rock), types of wells, and methods of harnessing the energy (Vapour dominated, liquid dominated), Ocean thermal energy conversion, principles, Open loop & closed loop OTEC Cycles. Tidal energy- potential, conversion techniques-single basin, two basin system. Wave energy: conversion techniques.

Captive power plant

Unit IV

Direct energy conversion & introduction to Micro-grid

Fuel cells-Principle of working of various types of fuel cells and their working, Hydrogen generation, battery energy storage system. Magneto-hydrodynamics (MHD)

Define grid, microgrid, importance of DG & microgrid, typical structure and configuration of a microgrid, AC and DC microgrids, modes of operations (grid connected & islanded).

Distributed generation (DG)

Textbook (s)

1. G.D. Rai, "*Non-Conventional Energy Sources"*, Khanna Publishers, 2nd Edition, 2017.
2. B H Khan, "*Non-conventional energy resources"*, Tata McGraw Hill Education Private Limited, 3rd Edition, 2015.
3. Alexis Kwasinski , Wayne Weaver, Robert S. Balog, "*Micro grids and other local area power and energy systems"*, Cambridge University Press, 1st Edition, 2016

Reference (s)

1. Tiwari and Ghosal, "*Renewable energy resources*", Narosa Publishing house, 2ndEdition, 2001
2. Ranjan Rakesh, Kothari D. P. & Singal K. C., "*Renewable Energy Sources and Emerging Technologies*", PHI, 2nd Edition, 2013.
3. Nikos Hatziargyriou, *"Micro grids: Architectures and Control*", Wiley, 1st Edition.
4. Electricity Act 2003, Renewable Energy Act 2015.
5. Indian Constitution-Articles 51A, 47, 48A.

21EE017 Sustainable Energy

Unit-I

Fundamentals of Sustainable Energy

Sustainable Energy Systems: Issues for the 21st century, Critical challenges for a sustainable energy future, definitions, indicators, Key energy stakeholders, Energy: conservation, efficiency.

investments and divestments.

Unit-II

Estimations and Evaluation of Energy resources

Units of measurement: Energy and Power, comparison of different forms of energy, the energy life cycle, estimation and valuation of fossil mineral fuels, estimation and valuation of Nuclear Fuel Resources, Estimation and Valuation of Renewable Energy Resources.

Lessons for Sustainable Development

Unit III

Technical Performance: Efficiency and Production Rates

The Relation of Technical Performance to Sustainability, An Introduction to Methods of Thermodynamic Analysis, The Importance of Rate Processes in Energy Conversion, Chemical

Rate Processes, The Physical Transport of Heat, Energy Requirements for Gas Separation Processes, Use and Abuse of Time Scales,
Energy Resources and Energy Conversion: Fertile Common Ground.

Unit IV

Local, Regional, and Global Environmental Effects of Energy

How Energy Systems Interact with the Environment, Adverse Environmental Effects over Local and Regional Length Scales, Global Climate Change: Environmental Consequences over Planetary Length Scales, Attribution of Environmental Damage to Energy Utilization, Methods of Environmental Protection, Environmental Benefits of Energy,
Implications for Sustainable Energy.

Textbook (s)

1. Jefferson W. Tester, Elisabeth M. Drake, Michael J. Driscoll, Michael W. Golay, and William A. Peters "Sustainable Energy: Choosing among options" Second edition, The MIT Press Cambridge, Massachusetts London, England, 2012.
2. Frank kreith, Susan krumdieck, "Principles of sustainable energy systems", second edition, CRC Press, Taylor and Francis group, 2008.

Reference book (s)

1. Ibrahim Dincer and Marc A. Rosen (Eds.), "Exergy. Energy, Environment and Sustainable Development" second edition, Elsevier sciences, 2013
2. Course readings and other reference are available on Canvas: https://umich.instructure.com/
3. US Department of Energy, Energy Information Administration: http://www.eia.doe.gov/
4. International Energy Agency: http://iea.org/

21ME005 Alternate Fuels and Emission Control In Automotives

Unit- I

Need for Alternative Fuels and Liquid fuels:

Need for Alternative Fuels, availability and comparative properties of alternate fuels, classification of alternative fuels. Liquid fuels Alcohol: Sources of Methanol and Ethanol, Properties of Methanol and Ethanol. Use of alcohols in S.I. and C.I. engines, performance of blending methanol with gasoline. Bio Diesels: raw materials used for production of Bio Diesel (Karanji oil, Neemoil, Sunflower oil, Soyabeen oil, Musturd oil, Palm oil, Jatropha seeds). The process of preparation of Bio-diesel performance of Engine with biodiesel-diesel blends.

Unit- II

Gaseous fuels

Gaseous Fuels - Availability, properties, and engine modifications required. Hydrogen as a substitute fuel . Study Properties, Sources and methods of Production of Hydrogen, Storage and Transportation of hydrogen. Application and advantages of liquid hydrogen used as fuel in IC engines. Biogas: Introduction to Biogas system, Process during gas formation, Factors affecting biogas formation. Biogas used as fuel in the SI & CI engines. LPG & CNG: Properties of LPG & CNG, fuel metering systems, performance and emission analysis. Fuel Cells: Concept of fuel cells and Layout of fuel cell vehicle.

Unit- III

Solar and Electric vehicles

Solar cells for energy collection. Storage batteries for solar energy, Layout of solar powered automobiles, advantages and limitations of solar powered vehicles. Layout of an electric vehicles, advantages & limitations. Systems components, electronic controlled systems, high energy and power density batteries. Maintenance of hybrid vehicle

Unit- IV

Emission measurement and control

Effects of constituents of Exhaust gas emission on environmental condition of earth (HC, CO_2, CO, NOx, SO_2 and O_2). Bharat Emission norms, Measurement & instrumentation for HC, CO_2, CO, NOx & PM, smoke meters, calibration checks on emission equipment's, SI engine emission

control: Engine design and fuel system parameters, Engine Department of Mechanical Engineering, GMRIT | Syllabus under Academic Regulation 2020 add-ons to enable reduction of engine-out emissions and Exhaust after treatment. CI engine emission control: Diesel Oxidation Catalyst, Impact of Sulphur on Oxidation Catalysts. Filters NOx Reduction: Exhaust Gas Recirculation, Lean NOx Catalysts NOx Absorber Catalysts Selective catalytic reduction.

Textbook(s)

1. V. Ganeshan, Internal Combustion Engines, McGraw Hill publishers, 4th Edition, 2017
2. A.K.Babu, Electric & Hybrid Vehicles, Khanna Books, 1st Edition, 2019
3. G. Amba Prasad Rao, T. Karthikeya Sharma, Engine Emission Control Technologies, Apple Academic Press, 1st Edition, 2020

Reference(s)

1. Tom Denton , Alternative Fuel Vehicles, Taylor & Francis, 7th Edition, 2019
2. John B Heywood, Internal Combustion Engines, McGraw Hill Education, 1st Edition, 2017
3. Simona, Hybrid Electric Vehicles, Springer India, 1st Edition, 2019.

21ME002 Principles of Entrepreneurship

Unit- I

Introduction to Entrepreneurship

Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur Vs. Manager, Entrepreneur Vs Entrepreneur. The Entrepreneurial decision process- Role of Entrepreneurship in Economic Developments, Ethics and Social responsibility of entrepreneurs, Woman as entrepreneur. Opportunities for entrepreneurs in India and abroad

Unit- II

Creating and starting the venture

Sources of new Ideas, Methods of generating ideas, creating problems solving, Product planning and development process The business plans Writing Business plan, Evaluating Business plans, Using and implementing business plans, marketing plan, financial plan and the organizational plan launching formalities.

Nature and scope of business plan.

Unit- III

Financing and managing the new venture

Source of Capital, record keeping, recruitment, motivating and leading teams, financial controls, Marketing and sales controls. E Commerce and Entrepreneurship New venture expansion strategies and issues Features evaluation of joint ventures, acquisitions, merges, franchising, Public issues, rights issues, bonus issues

Internet advertising

Unit- IV

Institutional support Entrepreneurship

Role of Dire crate of Industries, District Industries, Centers (DICS), Industrial development Corporation (IDC), state Financial corporation (SFCs), Small Scale Industries Development Corporations (SSIDCs), Khadi and village Industries Commission (KVIC), Technical Consultancy Organization (TCO), small Industries Service Institute (SISI), National Small Industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI), salient provision under Indian Factories Act, Employees State Insurance Act, Workmen's Compensation Act and payment of Bonus Act.

Labor legislation

Textbook (s)

1. Robert Hisrich & Michael Peters, Entrepreneurship, TMH, 5th Edition, 2009.
2. Dollinger, Entrepreneurship, Pearson Education, 4th Edition, 2004.
3. Robert J. Calvin, Entrepreneurial Management, Tata McGraw-Hill Education, 2004
4. Vasant Desal, The Dynamics of Entrepreneurial Development and Management Himalaya publishing House, 5th Edition, 2017.
5. Kaplan, Patterns of Entrepreneurship, Willey, 4th Edition, 2005.

Reference (s)

1. William A. Sahlman, James Stancill, Arthur Rock, Harvard Business Review on Entrepreneurship, Harvard Business School Press, Revised Edition, 2019.
2. Gurmeet Naroola, The Entrepreneurial Connection: East Meets West in the Silicon Valley, Special edition, TiE, 2001.

21MEC33 Quality Assurance and Reliability Engineering for Sustainability

Unit- I

Quality Assurance Tools and Techniques- Concept of quality characteristics, Value of quality, Quality of design and conformance, Process capability, selective assembly, concept in total quality control and quality system, Quality assurance for sustainability.

Unit- II

Statistical Quality Control- Quality cost aspects. Job plan. Case study in value analysis. Process control, Concept of S.Q.C. control chart for variable additives and attributes. Multi characteristics control chart. Acceptance sampling plan, single, Double and sequential sampling, ACL, LTPD concept. AOQL and rectification plan. Economic of inspection. Motivation for quality assurance. Total quality management principles, Zero defect program, Quality circle.

Unit- III

Reliability Engineering principles and methods- Definition of reliability, reliability vs quality, the failure distribution, the reliability function, mean time to failure, Hazard rate function, bathtub curve, conditional reliability, constant failure rate model, time dependent failure models e.g., exponential, Weibull and normal distribution.

Unit- IV

Sustainable Design for Reliability of Systems- Serial configuration, parallel configuration, combined series parallel systems, Reliability specification and system measurements, reliability allocation, design methods, FMEA failure analysis, system safety and fault tree analysis. Sustainability of Design for Reliability- Beyond reliability of systems, keeping the capability, keep the customers in mind and involved, make the most with vision and leadership, infrastructure, reinforcement and control organizational culture.

Textbook(s)

1. Introduction to Reliability and Maintenance engineering by Charles E Ebeling, Tata McGrawhill, India.
2. Introduction to statistical quality control, 4th Edition by Douglas C Montgomery, John Wiley & Sons, Inc.
3. K. C. Jain and A. K. Chitale, Quality Assurance and Total Quality Management, Khanna Publication, 3rd Edition, 2003.

Reference(s)

1. Fundamentals of quality control and improvement by Amitava Mitra, Pearson Education Asia.
2. Total Quality Management by Besterfield et al., Pearson Education, India, 2013.
3. David J Smith, "Reliability, Maintainability and Risk: Practical Methods for Engineers", Butterworth,2015.
4. Narayana V. and Sreenivasan N.S., Quality Management Concepts and Tasks, New Age International, 2015.
5. Vincent K. Omachonu and Joel E. Ross, Principles of Total Quality, 7th Edition, Taylor & Francis, 2017.

21ATX01 Environmental Studies

Unit I

Multidisciplinary nature of Environmental Studies and Natural Resources

Definition, Scope and Importance, Multidisciplinary nature of Environmental Studies, Value of Nature - Productive, Aesthetic/Recreation, Option, Need for Public Awareness, Institutions (BNHS, BVIEER, ZSI, BSI) and People in Environment (Medha Patkar, Sundarlal Bahuguna, Indira Gandhi, Rachael Carson).

Natural Resources: Renewable and Non-renewable resources – Importance, uses, overexploitation/threats, and conservation of (i) forest (ii) water (iii) mineral (iv) food and (v) energy resources. (The topics include benefits and problems associated with dams, mining and case studies), role of an individual in conservation of natural resources.

Unit II

Ecosystem & Biodiversity

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Biogeological cycles (Energy flow, Carbon and Nitrogen Cycles), Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structures and functions of the following ecosystems:

a. Forest Ecosystem b. Aquatic Ecosystem

Biodiversity and its Conservation: Definition and levels of biodiversity, Bio-geographical classification of India, hot spots of biodiversity - India as a mega diversity nation, Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation.

Unit III

Environmental Pollution &Social Issues

Environmental Pollution: Definition, Cause, effects, control measures and case studies of: Air pollution b. Water pollution c. Soil pollution

Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Disaster management (floods and cyclones)

Social Issues and the Environment: Sustainability, Urban problems related to energy, Water conservation and watershed management, Resettlement and rehabilitation of people; Environmental ethics: Issues and possible solutions, global warming, ozone layer depletion, Consumerism and waste products

Unit IV

Human Population and the Environmental Acts

Human Population and the Environment: Population growth, Affluence, Technology and Environmental Impact (Master Equation), Population explosion and Family Welfare Programme, Value Education, HIV/AIDS, Women and Child Welfare, Role of information Technology in Environment and human health.

Environment Protection Acts: Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act and Forest Conservation Act. Issues involved in enforcement of environmental legislation.

Text Book(s) and Reading Material (s)

1. E. Bharucha, Textbook of Environmental Studies, 1st Ed., University Press (India) Pvt. Ltd., 2005.
2. W.P. Cunningham, M.A. Cunningham, Principles of Environmental Science, 6th Ed., Tata McGraw Hill, 2008.
3. A. Kaushik,C.P. Kaushik, Perspectives in Environmental Studies, 4thEd., New Age International Publishers, 2008.
4. H.S. Peavy,D.R. Rowe, G.Tchobanoglous, Environmental Engineering, 1st Ed., McGraw Hill Int. ed., 1984.
5. T.E. Graedel, B.R. Allenby, Industrial Ecology and Sustainable Engineering, 1st Ed., Pearson Publications, 2009.

20ATX02 Professional Ethics and Human Values

Unit 1

Human Values

Morals, Values and Ethics-Integrity-Work Ethics- Service Learning- Civic Virtues- Respect for Others- Living Peacefully-Caring-Sharing-Honesty-Courage-Valuing Time- Cooperation-Commitment- Empathy- Self Confidence- Spirituality

Unit 2

Professional Ethics

The History of Ethics-Consensus and Controversy- Professional Roles of an Engineer-Professional and

Professionalism- Self Interest, Customs and Religion- Engineering and Ethics-Types of Enquiry

Unit 3

Responsibilities and Rights

Collegiality- Two Senses of Loyalty- Obligations of Loyalty- Professional Rights- Conflicts of Interest, Solving Conflict Problems- Self Interest, Customs and Religion- Ethical Egoism, Collective Bargaining- Confidentiality- Acceptance of Bribes/Gifts- Interests in other companies-Occupational Crimes- Industrial Espionage- Price Fixing- Endangering Lives- Whistle Blowing.

Unit 4

Global Issues

Globalization- Environmental Ethics-Computer Ethics- Weapons Development- Intellectual Property Rights (IPR)s

Suggested Books:

1. A Textbook On Professional Ethics and Human Values by R.S, Naagarazan, New Age International-2007
2. Professional Ethics and Human Values by M.P Raghavan, Scitech Publications-2013
3. A Foundation Course in Human Values and Professional Ethics by R.R. Gaur, R. Sangal.

21AT003 Design the Thinking

Unit I

Process of Design

Introduction – Product Life Cycle - Design Ethics - Design Process - Four Step – Five Step - Twelve Step - Creativity and Innovation in Design Process - Design limitation. History of Design Thinking, Multi-Whys, Design Thinking Empathize, Conflict of Interest, Multi-Whys, Elephant and Blind Men.

Unit II

Generating and Developing Ideas

Introduction - Create Thinking - Generating Design Ideas - Lateral Thinking – Analogies – brainstorming - Mind mapping - National Group Technique – Synectics -Development of work - Analytical Thinking - Group Activities Recommended.

UNIT III

Reverse Engineering

Introduction - Reverse Engineering Leads to New Understanding about Products - Reasons for Reverse Engineering - Reverse Engineering Process - Step by Step – Case Study.

UNIT IV

Basics of Drawing to Develop Design Ideas

Introduction - Many Uses of Drawing - Communication through Drawing – Drawing Basis – Line - Shape/ Form – Value – Colour – Texture - Practice using Auto CAD recommended. Perspective Drawing - One Point Perspective - Two Point Perspective -Isometric Drawing - Orthographic Drawing - Sectional Views - Practice using Auto CAD recommended.

Text Books:

John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) second Edition, 2013.

References:
Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.

21AT004 Ethics and Integrity

Unit I

Ethics and Interface

Ethics, Determinants and Consequences of Ethics in - Human Actions; Dimensions of Ethics; Ethics -in Private and Public Relationships. Human Values - Lessons from the Lives and Teachings of Great Leaders, Reformers and Administrators; Role of Family Society and Educational Institutions in Inculcating Values, Human interface.

Unit II

Human Values

Morals, values and Integrity, Service learning, Civic virtue Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Cooperation, Commitment, Self-confidence, Character, Spirituality

Unit III

Emotional Intelligence

Concepts, and their Utilities and Application in Administration and Governance. Contributions of Emotional Thinkers and Philosophers from India and World.

Unit IV

Risk Management and Issues

Engineering as Experimentation, Codes of Ethics, Assessment of Safety and Risk, Risk Benefit Analysis and

Reducing Risk, Intellectual Property Rights (IPR), Discrimination, Multinational Corporations, Moral Leadership, Code of Conduct, Corporate Social Responsibility.

Reference Book(s)

1. R.Subramanian, "Professional Ethics", Oxford University Press, New Delhi, 2013.
2. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering" Tata McGraw Hill, New Delhi, 2003.
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

21ATX05 Indian Heritage and Culture

Unit I

Fundamental Unity of India

Harappan and Vedic Culture- evolution of Caste system – Jainism and Buddhism Gandhara Art. Political unification of India under Mauryas and Guptas –Cultural achievements.

Cultural condition under the Satavahanas – Contribution of Pallavas and Cholas to Art and Letters. Cholas Administrative System. Influence of Islam on the India Culture. The SufiBhakti and Vishnavite movements.

Cultural achiements of Vijayanagara rulers Contribution of Shershah and Akbar to the evolution of Administrative system in India- Cultural Developments under Mughals.

Unit II

Westren Impact on India

Introduction of Western Education Social and Cultural awakening and social reform movements. Raja Rama Mohan Roy – Dayananda Saraswathi – Theosophical Society – Ramakrishna Paramahamsa and Vivekananda – Iswara Chandra Vidyasagar and Veeresalingam-Enancipation of women and struggle against caste – Rise of Indian Nationalism – Mahatma Gandhi – Nonviolence and Satyagraha – Education of untouchability – Legacy of British Rule.

Unit III

Culture and its salient features

Meaning, Definition and various inter relations of Culture. The Vedic – Upanishadic Culture and society. Human aspirations inthose societies Values – Chaturvidha Purusharthas – Chaturvarna

Theory – Cheturasrama Theory. The Culture in Artha Sastra, Kautilyan conception of the function of Philosophy, State, Religion and king.

Unit IV

Culture in Ramayana and Mahabharata

The Ideal Man and Woman, Concepts Maitri, Karuna, Seela, Vinaya, Kshama, Santi, Anuraga – as exemplified in the stories and anecodotes of the Epics. The Culture of Jainism: Jaina conception of Soul, Kamma and liberation, Buddhism as a Humanistic culture. The four Noble truths of Bhuddhism. Vedanta and Indian Culture. Religion and Ethical Practices: The Hindu View.

Suggested Books:

1. Indian Heritage and Culture by P R Rao, Sterling Publishers Pvt. Ltd.
2. Indian Heritage and Culture by D. Singh, APH Publishing Corporation.

21AT006 Intellectual Property Rights and Patents

Unit I

Intellectual Property

Introduction to Intellectual Property Law – The Evolutionary Past - The IPR Tool Kit- Para - Legal Tasks in Intellectual Property Law – Ethical obligations in Para Legal Tasks in Intellectual Property Law - Introduction to Cyber Law – Innovations and Inventions Trade related Intellectual Property Right

Unit II Trade mark

Introduction to Trade mark – Trade mark Registration Process – Post registration procedures – Trade mark
maintenance - Transfer of Rights - Inter parties Proceeding – Infringement - Dilution Ownership of Trade mark –
Likelihood of confusion - Trademarks claims – Trademarks Litigations – International Trade mark Law

Unit III Copyrights

Introduction to Copyrights – Principles of Copyright Principles -The subjects Matter of Copy right – The Rights Afforded by Copyright Law – Copy right Ownership, Transfer and duration – Right to prepare Derivative works – Rights of Distribution – Rights of Perform the work Publicity Copyright Formalities and Registrations - Limitations
- Copyright disputes and International Copyright Law – Semiconductor Chip Protection Act

Unit IV Trade Secret

Introduction to Trade Secret – Maintaining Trade Secret – Physical Security – Employee Limitation - Employee confidentiality agreement - Trade Secret Law - Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law

Textbook (s)

1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning , New Delhi
2. Prabhuddha Ganguli: ' Intellectual Property Rights" Tata Mc-Graw –Hill, New Delhi

Reference (s)

1. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
2. R.Radha Krishnan, S.Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi

21AT007 Introduction to Journalism

Unit I

Ingredients of News: meaning, definition, nature the news process: from the event to the reader Hard news vs Soft news, basic components of a news story attribution, embargo, verification, balance and fairness, brevity, dateline, credit line, byline.

Unit II

Journalism: A historical context Basic terminology, concepts in journalism organizing a news story, 5W's and 1H, Inverted pyramid Criteria for news worthiness, principles of news selection

use of archives, sources of news, use of internet. Yellow journalism penny press jazz journalism, gonzo journalism alternative journalism

Unit III

Language and Principles of Writing: Basic differences between the print, electronic and online journalism,

Language of news Robert Gunning: Principles of clear writing, Rudolf Flesch formula (www.lsrcollegejournalism.org)

Unit IV

Responsibility to Society: Press and Democracy, Relationship between the reader/viewer and media, Contemporary debates and issues relating to trial by media

Changing trends in Journalism: An overview (with special reference to India)

Textbooks:

1. Bruce D. Itule and Douglas A. Anderson, News Writing and reporting for today's media, McGraw Hill Publication, 2006.
2. M.L. Stein, Susan Paterno, R. Christopher Burnett, News writer's Handbook: An Introduction to Journalism, Blackwell Publishing, 2006.
3. George Rodmann, Mass Media In a Changing World, McGraw Hill Publication, 2011

21AT008 Mass Media Communication

Unit I

Introduction to Mass Communication:

Concept of Journalism and mass communication, mass communication in India, History, growth and development of print and electronic media; Major landmarks in print and electronic media in Indian languages. Media's role in formulation of states of India, Media criticism and media literacy, Press Council and Press Commissions of India, status of journalism and media education in India; Media policies of the Government of India since Independence.

Models and Theories of Mass Communication

Normative theories, administrative and critical traditions in communication, media and journalism studies, communication and theories of socio-cultural, ducational and agricultural change, Technological determinism, critique of Marshall McLuhan's views on media and communication and Marxist approaches, Information and knowledge societies. Indian traditions and approaches to communication from the Vedic era to the 21st century, Western and Eastern philosophical, ethical and aesthetic perceptions of communication – Aristotle and Plato, Hindu, Buddhist, and Islamic traditions.

Unit II

Media and Culture

Framework for understanding culture in a globalized world, Globalization with respect to politico-economic & socio-cultural developments in India.

Media Laws and Ethics

Concept of law and ethics in India and rest of the world, The Constitution of India, historical evolution, relevance; Concept of freedom of speech and expression in Indian Constitution; Defamation, Libel, Slanders-Sedition; Various regulatory bodies for print, TV, Advertising, PR, and Internet; Rules, regulations and guidelines for the media as recommended by Press Council of India; Information and Broadcasting ministry and other professional organizations, adversarial role of the media, human rights and media.

Unit III

Media Management and Production

Definition, concept of media management. Grammar of electronic media; Communication design theories and practice; Media production techniques – print and electronic; Digital media production techniques; Economics and commerce of mass media in India; Principles and management in media industry post liberalization.

Unit IV

ICT and Media

ICT and media – definition, characteristics and role. Effect of computer mediated communication. Impact of ICT on mass media. Digitization; Social networking; Economics and commerce of web enabled media; Mobile adaption and new generation telephony by media, ethics and new media; ICT in education and development in India, online media and e-governance; Animation – concepts and techniques

Textbooks:

1. D.S. Mehta, Mass Communication and Journalism in India, Allied Publishers, 2014
2. Keval J. Kumar, Mass Communication in India, Fifth Edition, JAICO Publishing House, Mumbai, 2021
3. B. K. Ahuja, Mass Media Communication, Lotus Press, 2010
4. Jack Rosenberry, Lauren A. Vicker, Applied Mass Communication Theory: A Guide for Media Practitioners, 2nd Edition, Routledge, 2017

References:

1. Peyton Paxson, Mass Communications and Media Studies: An Introduction, 2nd Edition, Bloomsbury Academic 2018.
2. Robert S. Fortner, P. Mark Fackler, The Handbook of Media and Mass Communication Theory, Wiley, 2014.
3. Vir Bala Aggarwal, V. S. Gupta, Handbook of Journalism and Mass Communication, Concept Publishing Company, New Delhi, 2002.

21AT010 Social Responsibility

Unit I

Introduction to Social Responsibility

Meaning and Definition, History of Social Responsibility, Concepts of Charity, Social philanthropy, Citizenship, Sustainability and Stakeholder Management, Environmental aspects of social responsibility.

Unit II

International framework for Social Responsibility

Millennium Development Goals, Sustainable Development Goals, Relationship between Corporate Social

Responsibility and Millennium Development Goals. OECD corporate social responsibility policy tool.

Unit III

Drivers of Social Responsibility in India

Market based pressure and incentives, civil society pressure, the regulatory environment in India Counter

trends, Review of current trends and opportunities in social responsibility, Review of successful corporate initiatives and challenges of social responsibility.

Unit IV

Identifying key stakeholders of Social Responsibility

Role of Public Sector in Corporate, government programs, Non-profit and Local Self Governance in implementing Social Responsibility, Global Compact Self-Assessment Tool, National Voluntary Guidelines by Govt. of India, Roles and responsibilities of corporate foundations.

Reference Book (s)

1. William B. Werther Jr. and David Chandler, Strategic Corporate Social Responsibility: Stakeholders in a Global Environment, Second Edition, Sage Publications, 2011
2. Sanjay K Agarwal, Corporate Social Responsibility in India, Sage Publications, 2008
3. Mark S. Schwartz, Corporate Social Responsibility: An Ethical Approach, Broadview Press, 2011

21AT011 The Art of Photography and Film Making

Unit I

Introduction

Development of Photography over the years: Brief History of Photography, early photography methods, switch from film to digital, difference between film and digital photography, formats of images in digital.Cameras & Techniques: Types of cameras, film cameras V/S digital cameras, lenses and their importance, Story Design and Development, Laws of Composition, Gestalt Law and Visual Perception, Semiotic photography.

Unit II

Lighting - Theory & practice: Sources of Lighting, 2 point lighting, 3 point lighting, creating contrast, outdoor natural lighting, related accessories for lighting.**Post production of Photos, Digital Image Editing** – Photoshop: Processing of Raw images, Introduction to Adobe Photoshop and image ready software, how to enhance the photo digitally.

Unit III

Indian Cinema

History of Indian cinema, history of regional cinema, legends of Indian cinema, Hindi film industry, the Hindi film industry, music and choreography in Indian cinema, contemporary cinema.

Basics of Cinematography-1

Power of a Picture: Power of a still picture shooting a good Still picture Composition-Framing Understanding & Use of colour, Capturing the Drama, Black and white Photography. **Light:** Role of light, Lighting techniques, Concept of lighting various planes, Understanding Various types: Tungsten lamps, Cool Lights, HMI, Cyclorama/background lights, Soft Box lights. Use of cutter stand, black cloth and Camera filters, barn doors, use of reflectors, Three point lighting, Ratio lighting: 1:2, 1:3, 1:4.

Unit IV

Lenses: Type of Lenses, Power of Lenses, Understanding the shot requirement and usage of a lens, Idea of perspective: Depth Of Field, Depth of focus, Critical understanding of Fixed Lens Vs. Zoom Lens, Focus pulling, 18% grey card, Metering, Colour temperature meter.

Camera Movements: Basic grammar of shots, Camera Movement: Pan, Tilt, Zoom, Character Movement, Usage and need of Track and trolley, Crane, jimy gip, Poll Cam, Managing Movements, Single camera Setup, Multi camera setup, Continuity Exercise, Do's and don'ts of camera movements, Aesthetics and Psychological.

Textbooks:

1. Camera Terms and Concepts by David Elkins
2. The Camera Assistant by Doug Hart
3. Motion Picture Camera and Lighting Equipment by David Samuelson
4. The Art of Photography; by Bruce Barnbaum.
5. Creative Nature & Outdoor Photography; Brenda Tharp.
6. Chasing the Light by Ibarionex Perello.

Reference Books:

1. Motion Picture Camera Techniques by David Samuelson
2. The 16mm Camera Book by Douglas Underdahl
3. The Hands On Manual for Cinematographers by David Samuelson
4. The Professional Lighting Handbook by Verne Carlson
5. The Filmmakers Pocket Reference by Blain Brown
6. The Camera by Larry Hills.
7. The Creative Black Book.
8. The Print by Ansel Adams, Robert Baker.
9. 500 poses for Photographing Women by Michelle Perkins.

21AT012 Gender Equality for Sustainability

Unit I

Understanding Sustainability

The UN 2030 Agenda for Sustainable Development Goals (SDGs); Interrelating SDG 5 (Gender equality) with other SDGs; Economics and Gender: Issues and Concerns; Women and Education: Role of Education in enhancing gender equality--A Case Study of Malala Yousafzai; Need for Gender Equality for EnsuringSustainability: Why gender equality must be integral to sustainable development; Empowering women and promoting gender equality; Technology and gender equality

Unit II

Gender Equality: Dimensions

Women and Health: Importance of good health for gender equality; Women and Governance: promoting equal rights, opportunities and responsibilities for men and women; Women Empowerment: Inevitable foundation for a peaceful, prosperous and sustainable world; Women and Poverty Reduction: Elimination of socioeconomic inequalities and sustainable production by women; Women and Sustainable Consumption: Strategies to make women play a crucial role for and in a circular economy .

Unit III

Gender and Economic Growth

Role of Women in Economic Growth: productivity, economic diversification, and income equality; Women and Sustainable Production: Role of women as natural resource managers and in waste management;

Women and Poverty Eradication through Government Schemes: National/Government and intergovernmental schemes and frameworks to reduce poverty and enhance socioeconomic status of women; Women and Poverty Eradication through Entrepreneurship: Developing and enabling women to be entrepreneurs; Women and Self- Help Groups: Case Studies.

Unit IV

Gender Equality and Public Policy

Role of Women in Governance: Gender equality in public employment and decision-making process in governance; United Nations and Gender Inclusiveness: UN General Assembly discussions; Role of Local Self Government in Inclusive Growth: Panchayati Raj system in India and women representation; Gender equality and environmental sustainability: gender equality for sustainable ecosystem management; Project-based Leadership and Gender Equality

Textbooks:

1. *Gender Equality and Sustainable Development* by Melissa Leach (ed), 1st Edition, Routledge, 2015.
2. *Gender Equality in a Global Perspective*, Eds: Anders Ortenblad, Raili Marling, Snjezana Vasiljevic;
3. Routledge; 1st edition (January 24, 2017).
4. *Transitioning to Gender Equality* by Christa Binswanger and Andrea Zimmermann (Eds.), MDPI, 2021.
5. *Gender Equality and Public Policy: Measuring Progress in Europe* by Paola Profeta, Camridge University Press, 2020.
6. *Gender and Sustainable Development*.

Reference Materials:

1. Gender equality handbook by Swedish Civil Contingencies Agency (MSB);2009;
2. Turning promises into action: Gender equality in the 2030 Agenda for Sustainable Development, UN Women Headquarters, 2018.
3. GENDER EQUALITY AS AN ACCELERATOR FOR ACHIEVING THE SUSTAINABLE DEVELOPMENT GOALS. Discussion Paper by The United Nations Development Programme (UNDP), 2018.
4. 2021 Report on Gender Equality in the EU. European Commission, 2021.
5. Global Gender Gap Report 2021. World Economic Forum, 2021.

21AT013 Women in Leadership

UINT-I

Education, Employment and Empowerment

Higher education for women, strategies to implement women's education in rural areas - Women's reservation in education sector, Formal and non-formal ways to education, National Literacy Mission, Traditions, maintaining family honour as strategies to curb financial independence

Unit-II

Roles of Women in Family and Society

Archaeology of the evolution of women's role - Gender roles in the domestic sphere - Kitchen space feminism - Gender roles in the social sphere - Matriarchy and Matrilineal societies

Unit-III

Women in Sports

Physical and Psychological effects of Sports on women - Socio-cultural and economic factors that deter Women's talent in Sports - Against all the odds- Narratives of Women athletes and Sport Stars – Serena Williams, Saina Nehwal, Sania Mirza, Deepika Palikal, Mary Kom - Gender testing, Drug tests and other issues related to sex determination process in sports

Unit-IV

Women Entrepreneurship

Significance of women entrepreneurship, Challenges faced by Women Entrepreneurs, - Relationship between Entrepreneurship and empowerment, Evolution of women entrepreneur development programme, Trends and Patterns of Women Entrepreneurship

Text Books:

1. Haque, T. 2015. Empowerment of Rural Women in Developing Countries: Challenges and Pathways.
1. New Delhi: Concept Publishing Company. Sen, Amartya. Development and Freedom. New Delhi: Oxford University Press, 2000.
2. Agarwal, Suresh. 2015. Social Problems in India. New Delhi: Rajat Publications. Daly, Mary. Beyond God the Father.

Reference Text Books:

1. Drinkwater, Barabara, Ed. 2000. Women in Sport. Oxford: Blackwell Science.
1. Hisrich, Robert D.,Michael Peters and Dean Shepherded-" Entrepreneurship " 9th Tata McGraw Hill 2012.
2. Peter F.Drucker "Innovation and Entrepreneurship", Reprint Heinemann 2006.

21AT015 Climate Changes and Circular Economy

Unit I

Introduction:

Climate in the Spotlight, -The Spectrum of Scientific Opinion, -Pundits, Advocates and pocalypse, The Earth's Natural Greenhouse Effect -,-Why the Earth is a Nice Place to Live,-The Radioactive Balance,-The Importance of Water-Greenhouse Gases-The Role of Carbon Dioxide, -The Role of Methane, -Major Uncertainties CO2 Emissions -Human Emissions of CO2, -How Much Carbon in the Ground?, -Different Concerns of Rich and Poor Countries, the Earths Carbon Reservoirs -What is Biogeochemistry?, -Why is the Atmospheric Carbon Reservoir so Small?, -Breathing of Gaia, -The Missing CO2 Sink Carbon Cycling: Some Examples -The Physical Carbon Pump, -The Biological Carbon Pump, -The Marine Carbon Cycle, -The Terrestrial Carbon Cycle Climate and Weather -Climate and Weather: Some Definitions, -The Earth's Climate Machine.

Unit II

Global Wind Systems:

Trade Winds and the Hadley Cell,-The Highs and Lows of the Westerlies, -The Vital Importance of Monsoon Rains, -Why are there Seasons, Clouds, Storms and Climate -Cloud Formation and Climate,-Hurricanes and Global Warming Global Ocean Circulation -Introduction and Overview, -Strawberries in Norway, -The Icelandic Whirlpool,-Origin of the Gulf Stream,-The Deep Atlantic

Conveyor : El Niño and theSouthern Oscillation -El Niño and its Effects,-Upwelling and Climate Outlook for the Future -Introduction to Climate Change,-Advances in Computer Modelling,-Physics versus Fudge Factors.

Unit III

Introduction to circular economy:

Purpose of circular economy, Circular sustainability, Challenges for circular economy Concept of sustainable development, Sustainable processes technologies and Critical assessment on current sustainable technologies. Circular bio economy, Circular Business Models. Circular business models to create economic and social value.

Unit IV

Circular economy policy framework:

Universal circular economy policy goals, role of governments and networks and how policies and sharing best practices can enable the circular economy. Circular economy towards zero waste: circular economy and waste sector, waste management in the context of circular economy

LCA : An Introduction to Sustainability Concepts and Life Cycle Analysis , Environmental Data Collection and LCA **Methodology Life Cycle Assessment** – Detailed Methodology and ISO Framework Life Cycle Inventory
and Impact Assessments, Factors for Good LCA Design for Sustainability.

Reference Book(s)

1. Webster, K. Circular Economy: A Wealth of Flows. Ellen MacArthur Foundation, 2nd Edition, 2016.
2. McDonough, William, and Michael Braungart. Cradle to Cradle: Remaking the Way We Make Things.
New York: North Point, 2002.
3. Raworth, K. Doughnut Economics. Seven Ways to Think Like a 21st -Century Economist. Random House,
2017. Print.
4. Ellen MacArthur Foundation, “Delivering the Circular Economy: A Toolkit for Policymakers” Ellen
MacArthur Foundation. 2015.
5. A. Tukker, et al, "The Impacts of Household Consumption and Options for Change," Journal of Industrial
Ecology, Vol. 14: 13-39, 2010.