

## 1.3.1: Courses relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum

List of Courses

S.No	Course Code	Course Title
1	21CE502	Environmental Engineering
2	21CE505	Environmental Engineering Laboratory
3	21CE001	Disaster Management
4	21CE002	Air Pollution and Environmental Impact Assessment
5	21ATX01	Environmental Studies
6	21ATX02	Professional Ethics and Human Values
7	21AT004	Ethics and Integrity
8	21AT008	Introduction to Journalism
9	21HSX10	Engineering Economics and Project Management
10	20AT003	Design The Thinking
11	20AT007	Intellectual Property Rights and Patents
12	21AT005	Indian Heritage and Culture
13	21AT006	Human Values and Professional Ethics
14	21AT015	Introduction to Research Methodology
15	21AT011	The Art of Photography and Film Making
16	21AT013	Women in Leadership
17	19ME015	Quality Engineering
18	19ME009	Total Quality Management
19	20ME004	Alternate fuels and Emission controls in Automotives
20	20ME002	Principles of Entrepreneurship
21	20MEC33	Quality Assurance & Reliability Engineering for Sustainability

### Description of Courses

S.No	Course Code	Course Name	Description
1	21CE502	Environmental Engineering	This course is a subfield of engineering that is concerned with the protection and preservation of the environment and environmental resources as well as the protection of populations from environmental threats. The course deals with population growth and scientific solutions for environmental problems like air pollution, water pollution and finding renewable energy sources.
2	21CE505	Environmental	This course provides a scientific and

		Engineering Laboratory	engineering basis for understanding environmental issues and problems. The Environmental Engineering laboratory practical provides good insight into different experimental methods relevant to Environmental Engineering. In this laboratory various test on potablewater and sewage samples to check pH value, total dissolved solids, BOD and COD, total suspended particles etc. will be performed
3	21CE001	Disaster Management	This course will take an Indian perspective and, at times, consider also National Disaster Management Authority and disaster history. To be a modern and effective disaster manager, a student will need to gain knowledge in four critical areas of knowledge: Natural Environment, Engineered Environment, Socio Demographics, and Emergency Management. Although understanding these areas of knowledge will give a student a multidisciplinary perspective, the objective is to become an interdisciplinary hazards manager, knowing how to assess hazards through a variety of perspectives. Hazards managers wear two hats, that of a hazard mitigation generalist addressing three of these critical areas of knowledge (natural environment, engineered environment, and socio-demographics, but, also, be specifically knowledgeable in emergency management responsibilities in hazards management.
4	21CE002	Air Pollution and Environmental Impact Assessment	Air Pollution and Environmental Impact Assessment helps to overcome the problems of environmental degradation and to plan the development process in a sustainable manner so that control and mitigation measures can be undertaken prior to occurrence of degradation. This course addresses the need and concept of environmental impact assessments.
5	21ATX01	Environmental Studies	The need for sustainable development is a key to the future of mankind. This course provides an understanding about continuing problems of pollution, loss of forest, solid waste disposal, degradation of environment, issues like economic productivity and national security, Global

			warming, the depletion of ozone layer and loss of biodiversity.
6	21ATX02	Professional Ethics and Human Values	This course helps students understand and learn professional ethics, professional responsibilities, rights, and global issues pertinent to cyber, weapons development, and environment.
7	21AT004	Ethics and Integrity	This course is aimed to provide a common understanding of best ethical practices and standards of integrity that are appropriate for work places. The course deals with importance of ethical decision making that employee can adopt when faced with an ethical dilemma. The intent is to demonstrate the breadth of responsibility of the individual manager, organization, and corporation in making "ethical" decisions.
8	21AT008	Introduction to Journalism	Being able to critically reflect on the social, political, economic and global contexts in which communication takes place. Knowing the history and the theories underpinning the journalism and communication fields. Demonstrating the cognitive, research, analytical, critical thinking, communication and presentation skills, and communication and presentation skills required for undergraduate study and professional practice, Being able to apply the ethics and regulations which govern modern media and communication practice. The ability to recognize news and to apply critical thinking, analytical skills and ethical practice in the gathering and presentation of news within the context of the professional requirements and demands of the multimedia newsroom.
9	21HSX10	Engineering Economics and Project Management	Acquire knowledge of economics to facilitate the process of economic decision making. Acquire knowledge on basic financial management aspects. Develop the skills to analyze financial statements. The importance of economics and management in engineering and helps engineers in managerial decision making. Engineering economics is closely associated with conventional microeconomics; but here, its focus is on problem solving at operational levels.

10	20AT003	Design The Thinking	Design Thinking Fundamentals is an immersive and practical course that introduces students to the principles, methodologies, and applications of design thinking. This course is designed to equip participants with the mindset and skill set necessary to tackle complex problems, foster innovation, and create user-centric solutions across various domains.
11	20AT007	Intellectual Property Rights and Patents	The Intellectual Property Rights (IPR) Fundamentals course is designed to provide participants with a comprehensive understanding of intellectual property laws, principles, and practices. This course aims to familiarize students with the different types of intellectual property rights, their significance in various industries, and the legal framework governing their protection.
12	21AT005	Indian Heritage and Culture	Delve into the tapestry of Indian Heritage and Culture in this engineering-focused course. Gain insights into the historical, artistic, and philosophical dimensions, fostering a cultural understanding relevant to diverse engineering disciplines. Explore the intersection of technology and tradition, emphasizing the importance of heritage preservation and sustainable design. Engineers will develop a nuanced perspective, learning to integrate cultural considerations into their projects, contributing to a harmonious coexistence of modern engineering and India's cultural richness.
13	21AT006	Human Values and Professional Ethics	Embark on a transformative exploration of Human Values and Professional Ethics tailored for engineering students. This course instills a strong ethical foundation, emphasizing integrity, responsibility, and social consciousness in engineering practice. Through case studies and discussions, students learn to navigate ethical dilemmas inherent in the profession. Fostering a sense of responsibility towards societal well-being, the course equips engineers with the tools to make principled decisions in their professional endeavors. Prepare to emerge not only as technically proficient engineers but also as ethical

			leaders committed to upholding the highest standards of conduct in the engineering field.
14	21AT015	Introduction to Research Methodology	Embark on a comprehensive journey into Research Methodology tailored for engineering students. This course equips aspiring engineers with essential skills in formulating research questions, conducting literature reviews, and employing quantitative and qualitative methodologies. Through practical applications, students learn to design experiments, analyze data, and draw meaningful conclusions. Emphasizing ethical considerations, the course prepares engineers to contribute substantively to the advancement of knowledge in their respective fields. Engage in hands-on projects to develop a robust foundation in research, empowering future engineers to navigate and contribute to cutting-edge advancements in their disciplines.
15	21AT011	The Art of Photography and Film Making	Photography and Filmmaking are creative art forms that require aptitude, passion, and a whole lot of professionalism. This course has just the right blend of elements that help groom a student into a market-ready professional. It begins by imbibing the discipline and work ethics that transform you into an individual capable of thinking independently and creatively
16	21AT013	Women in Leadership	The objective of this course is to inspire and empower women across the world to engage in purposeful career development and take on leadership for important causes. The opportunities, challenges, trade-offs, and organizational dynamics experienced by women in work organizations, as well as reflect on and practice effective individual behaviors will be addressed
17	19ME015	Quality Engineering	This course provides students with the analytical and management tools necessary to solve manufacturing quality problems and implement effective quality systems. Topics include, the Six Sigma problem solving methodology, process capability analysis, measurement system analysis, statistical process control, failure mode and

			effects analysis and quality function deployment.
18	19ME009	Total Quality Management	This course consists of organization-wide efforts to "install and make permanent climate where employees continuously improve their ability to provide on demand products and services that customers will find of particular value. The course also provides an insight about the ISO standards for design and development of products and services.
19	20ME004	Alternate fuels and Emission controls in Automotives	This course is designed to provide students with a comprehensive understanding of the challenges and opportunities associated with the use of alternative fuels and emission control technologies in the automotive industry. The course covers a range of topics related to sustainable transportation and environmental impact mitigation.
20	20ME002	Principles of Entrepreneurship	This course is designed to Impart various principles of entrepreneurship in enhancing the entrepreneur skills in students in addition to the classical management concepts and design of organizational structures. Students gain knowledge about Project Management techniques and understand the relation between market demands and production capability for maximum effectiveness in an economic manner of all the production activities.
21	20MEC33	Quality Assurance & Reliability Engineering for Sustainability	It focuses on integrating principles of quality assurance and reliability engineering with a sustainability perspective. It addresses the need for sustainable practices in product development, manufacturing, and operations.



**Syllabus**

**21CE502 Environmental Engineering**

**3 0 0 3**

**Course Outcomes**

1. Explain the necessity of water supply system and characteristics of water and wastewater
2. Classify and Compare between the conveyance systems and the appurtenances used in water supply system.
3. Design various units of conventional water treatment plant and water supply system
4. Explain the need of advanced treatment processes in water and wastewater treatment
5. Design various units in wastewater treatment plant
6. Adapt a treatment unit for the safe disposal of sludge and effluent into the environment

**COs-POs Mapping**

COs	PO3	PO6	PO7	PO12
1	1	2	3	2
2	2	2	3	2
3	3	2	3	2
4	2	2	3	2
5	3	2	3	2
6	2	2	3	2

3 – Strongly linked | 2 – Moderately linked | 1 – Weakly linked

**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*

**12 Hours**

**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*

**12 Hours**

**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*

**12 Hours**

#### **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.*

**12 Hours**

**Total: 48 Hours**

#### **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. 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.



## 21CE505 Environmental Engineering Laboratory

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### Course Outcomes

1. Demonstrate how to perform relevant tests in the laboratory to determine the major characteristics of water and wastewater
2. Make use of various equipment/methods available for examining water and wastewater
3. Identify the practical significance of the characteristics, the relevant codes of practice for examination and permissible limits for the characteristics of water and wastewater
4. Assess the pollutant concentration in water and wastewater
5. Choose various treatment techniques for water, wastewater and recycled water
6. Recommend the degree of treatment required for the water and wastewater

### COs-POs Mappings

COs	PO3	PO6	PO7	PO12
1	3	3	2	3
2	3	3	2	3
3	3	3	2	3
4	3	3	2	3
5	3	3	2	3
6	3	3	2	3

3 – Strongly linked | 2 – Moderately linked | 1 – Weakly linked

### List of Experiments

1. Determination of pH and Electrical Conductivity
2. Determination and estimation of total Hardness
3. Determination of Calcium and Magnesium hardness
4. Determination of Alkalinity
5. Determination of Acidity
6. Determination of chlorides in water.
7. Determination and estimation of total solids, dissolved solids
8. Determination of Iron
9. Determination of Optimum Coagulant dosage
10. Determination of dissolved oxygen with D.O Meter & Winkler 's Method
11. Determination of B.O.D
12. Determination of COD
13. Determination of chlorine demand
14. Determination of Flourides
15. Determination of Sulphate
16. Determination of Phospate

### List of Augmented Experiments

1. pH and Electrical Conductivity value of different samples
2. Estimation of total Hardness of bore water
3. Determination of Calcium and Magnesium hardness of bore water
4. Determination of Alkalinity and Acidity of different samples
5. Determination of chlorides in water.
6. Estimation of total solids, dissolved solids in Surface water and sub-surface water

sample

7. Determination of dissolved oxygen of pond water with D.O Meter & Winkler 's Method
8. Physical parameters-Temperature, Turbidity
9. B.O.D/COD of different samples
10. Determination of chlorine demand for municipal water
11. Determine the Sulphate and Phosphate nature of the water and wastewater samples

**Total: 48 Hours**

### **Reading Materials (s)**

1. Environmental Engineering Lab Manual-Civil Engineering, GMRIT, Rajam
2. Standard Methods for Examination of Water and Waste Water, 23rd Edition, APHA. KVSG Murali Krishna, Chemical Analyses of Water and Soil,3rd Ed., Reem Publications, New Delhi. 2013

## 21CE001 Disaster Management

3 1 0 3

### Course outcomes

1. Build knowledge about need and importance of hazard management in the concern field
2. Understand the causes of Natural and Manmade disasters
3. Outline the mitigation measures for Natural and Manmade disasters
4. Understand the importance of science and technology in disaster risk management
5. Build knowledge on importance of authorities and their risk management
6. Understand the scenarios of various disasters and mitigation

### COs-POs Mapping

COs	PO2	PO7
1	2	2
2	3	3
3	3	2
4	3	3
5	1	2
6	1	3

3-Strongly linked | 2-Moderately linked | 1-Weakly linked

### Unit I

#### Introduction to Disaster Management

Components of disaster management-Organizational structure for disaster management-Disaster management schemes- Disaster Risk Reduction-Global Policies and Practices - Basic Strategies and Practices of Disaster Reduction- Disaster Risk Reduction with Global Framework.

*Role of Government and NGO Bodies, Role of Engineers on Disaster Management.*

**12+3 Hours**

### Unit II

#### Natural and Manmade Disasters

Management of Natural Disasters: Floods, Droughts, Earthquakes, Global Warming, Cyclones, Landslides, Tsunamis Causes, effects, mitigation. Effects on poverty, Climate Change and Human Health.

Management of Manmade Disasters: Solid waste, Fire, Bio-terrorism, Emerges infectious diseases, Transportation Accidents, Structural failures Causes, effects, mitigation.

*Volcanic eruptions, mining.*

**11+4 Hours**

### Unit III

#### Science and Technology in Disaster Management

Implementation of Technology for Infrastructure, Disaster Management for Infrastructure, Geospatial Information in Agriculture Drought Assessment and Monitoring. Multimedia Technology in Disaster Risk Management Training, Disaster Communication System (Early Warning and its Dissemination) - Essentials of School Disaster Education, Community based Disaster Management.

*Role of IT in Disaster Preparedness, Role of Educational Institute*

**11+4Hours**

## Unit IV

### Disaster Risk Management in India and Case Studies

Disaster Management Indian scenario - India's vulnerability profile - Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders, Policies and legislation for disaster risk reduction, DRR programs in India and the activities of National Disaster Management Authority.

Cases Studies: Natural Disaster -Floods, Earthquakes, Cyclones, Tsunamis. Manmade Disaster: Industrial Accidents, Transportation Accidents and Terrorism & Bio-terrorism. *Droughts, Nuclear Disaster.*

**11+4Hours**

**Total: 45+15Hours**

### Text Book(s):

1. Disaster management - Global Challenges and local solution, Edited by Rajibshash and R.R.Krishnamurthy (2009) published by universities press
2. Disaster management - future challenges and opportunities (2007) editor by Jagbirsingh. Published by I K international Publishing house pvt.Ltd.
3. Disaster management, (2021), editor by R. Subramanian, Vikas Publishing, Noida.

### Reference Book(s):

1. Disaster management edited by H K Gupta (2013) published by universities press.

## 21CE002 Air Pollution and Environmental Impact Assessment 3 1 0 3

### Course Outcome

1. Understand basic aspects on air pollution and the quality of atmospheric environment
2. Interpret the different types of air pollution and the means of abatement control
3. Identify the sources for noise pollution and control methods
4. Understand the different steps within environmental impact assessment
5. Compare both orally and in written form the key aspects of environmental impact assessment
6. Explain the examples of EIA in practice with different case studies.

### COs-POs Mapping

COs	PO6	PO7	PO1 2
1	1	2	1
2	1	2	1
3	1	2	1
4	2	1	1
5	2	1	1
6	2	1	1

3-Strongly linked | 2-Moderately linked | 1-Weakly linked

### 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.*

**11+4 Hours**

### 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.*

**11+4 Hours**

### 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.*

**12+3 Hours**

## 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.*

**11+4 Hours**

**Total Hours: 45+15 Hours**

### Text book (s)

1. M. N. Rao and H. V. N. Rao, Air pollution, Tata McGraw-Hill, New Delhi, 1993
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.



## 21ATX01 Environmental Studies

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### Course Outcomes

1. Translate the learner's attitude to think globally and act locally
2. Motivate environmental organizations to create a concern about our present state of Environment.
3. Find solutions for conservation of natural resources
4. Identify the benefits of ecosystem conservation, biodiversity protection, implement pollution prevention and control measures
5. Illustrate social issues of environmental protection and adopt sustainable developmental practices
6. Perceives the basic structure of environmental policy and law pertaining to specific environmental issues (water quality, air quality, biodiversity protection, Forest, etc.)

### COs - POs Mapping

COs	PO1	PO6	PO7	PO12
1	1	2	3	1
2	2	-	3	2
3	3	3	-	2
4	-	2	3	2
5	-	-	3	1
6	-	3	2	1

3-Strongly linked | 2-Moderately linked| 1-Weakly linked

### 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, 1<sup>st</sup> Ed., University Press (India) Pvt. Ltd., 2005.
2. W.P. Cunningham, M.A. Cunningham, Principles of Environmental Science, 6<sup>th</sup> Ed., Tata McGraw Hill, 2008.
3. A. Kaushik, C.P. Kaushik, Perspectives in Environmental Studies, 4<sup>th</sup> Ed., New Age International Publishers, 2008.
4. H.S. Peavy, D.R. Rowe, G. Tchobanoglous, Environmental Engineering, 1<sup>st</sup> Ed., McGraw Hill Int. ed., 1984.
5. T.E. Graedel, B.R. Allenby, Industrial Ecology and Sustainable Engineering, 1<sup>st</sup> Ed., Pearson Publications, 2009.
6. <http://172.30.1.222/wbc/it/schedule.aspx>.
7. <http://172.30.1.8/wbc/it/coursepage.aspx>.
8. <https://www.edx.org/course/environmental-protection-and-sustainability>.

## 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-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.

## 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.

## **21AT008 Introduction to Journalism**

**UNIT I:** Ingredients of news 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

**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)

## 21HSX10 Engineering Economics and Project Management

3 0 0 3

### Course Outcome(s)

1. Illustrate the basic principles of engineering economics.
2. Demonstrate Cost-Volume-Profit (CVP) analysis in business decision making.
3. Implement the simple financial statements for measuring financial performance of a firm.
4. Evaluate investment proposals through various capital budgeting methods.
5. State key issues of organization, management and administration.
6. Determine the accurate project cost estimates and plan future activities.

### COs – POs Mapping

COs	PO <sub>10</sub>	PO <sub>11</sub>	PO <sub>12</sub>
1	1	1	2
2	3	2	1
3	3	3	2
4	2	2	1
5	1	2	1
6	2	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

### Unit-I

#### Introduction to Engineering Economics - Demand Forecasting & Cost Analysis

Concept of Engineering Economics – Types of efficiency – Managerial Economics Nature and Scope – Law of Demand – Types of Elasticity of demand.

Demand Forecasting & Cost Analysis: Demand Forecasting: Meaning, Factors Governing Demand Forecasting, Methods of Demand Forecasting (Survey and Statistical Methods) – Cost Analysis: Basic Cost Concepts, Break Even Analysis.

*Factors affecting the elasticity of demand – Supply and law of Supply*  
**10 + 3 Hours**

### Unit-II

#### Market Structures - Financial Statements & Ratio Analysis

Different type of Markets Structures – Features – Price Out-put determination under Perfect Competition and Monopoly

Financial Statements & Ratio Analysis: Introduction to Financial Accounting – Double entry system – Journal – Ledger – Trail Balance – Final Accounts (with simple adjustments) – Financial Analysis through Ratios: Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio, Creditors Turnover Ratio, Capital Turnover Ratio), Solvency Ratios (Debt-Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

*Price output determination under Monopolistic markets, Accounting concepts and conventions*     **13 + 4 Hours**



## **Unit-III**

### **Investment Decisions and Fundamentals of Management**

Time Value of Money – Capital Budgeting: Meaning, Need and Techniques of Capital Budgeting

Introduction to Management: Nature – Importance – Classical Theories of Management: F.W.Taylor's and Henri Fayol's Theory – Functions and Levels of Management – Decision Making Process – Inventory Control, Objectives, Functions – Analysis of Inventory – EOQ. *Maslow & Douglas McGregor theories of Management, ABC Analysis*

**10 + 4 Hours**

## **Unit-IV**

### **Project Management**

Introduction – Project Life Cycle and its Phases – Project Selection Methods and Criteria – Technical Feasibility – Project Control and Scheduling through Networks – Probabilistic Models of Networks – Time-Cost Relationship (Crashing) – Human Aspects in Project Management: Form of Project Organization – Role & Traits of Project Manager.

*Sources of Long-term and Short-term Project Finance*

**12**

**+ 4 Hours**

**Total: 45+15 Hours**

## 20AT003 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.

## 20AT007 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 I 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

## 21AT005 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 achievements 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 Paramahansa 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 in those 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 anecdotes of the Epics.

The Culture of Jainism: Jaina conception of Soul, Karma and liberation, Buddhism as a Humanistic culture. The four Noble truths of Buddhism.

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 Human Values and Professional Ethics

### 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, Excel Books -2010

## **21AT015 Introduction to Research Methodology**

### **Unit I**

#### **Introduction to Research Methodology**

Meaning of Research, Objectives of Research, Motivation in Research, Types of Research- descriptive vs. analytical research, applied vs. fundamental research, quantitative vs. qualitative research, conceptual vs. empirical research, Research Approaches, Significance of Research

### **Unit II**

#### **Defining the Research Problem**

What is a Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, Research Questions, Research Methods vs. Research Methodology

### **Unit III**

#### **Hypothesis**

Literature Review-Review Concepts and Theories, Formulation of Hypothesis-Sources of Hypothesis, Characteristics of Hypothesis, Role of Hypothesis, Tests of Hypothesis- Research Design, Sampling Design, Data Collection, Observation Method, Interview Method, Current trends in Research- Mono-disciplinary Research, Trans-disciplinary Research, Inter-disciplinary Research

### **Unit IV**

#### **Interpretation and Report Writing**

Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Use of Ms-word and Latex for writing technical report.

#### **Suggested Books:**

1. C.R. Kothari and Gaurav Garg, "Research Methodology-methods and techniques", New Age International (P) Limited, 3<sup>rd</sup> Edition, 2012.
2. R. Panneerselvam, "Research Methodology", PHI Learning, 2<sup>nd</sup> Edition, 2014.



## 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, jimmy 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.
10. Creative Landscapes: Digital Photography Tips & Techniques by Author: Davis, Harold.

## 21AT013 Women in Leadership

### UNIT-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. 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.
2. Hisrich, Robert D., Michael Peters and Dean Shepherded-“ Entrepreneurship “ 9<sup>th</sup> Tata McGraw Hill 2012.
3. Peter F. Drucker “Innovation and Entrepreneurship”, Reprint Heinemann 2006.

## 19ME015 Quality Engineering

### Unit- I

Quality Engineering and Management Tools and Techniques- 7 QC tools, 7 New Quality Management Tools, 5S Technique, Kaizen, Poka-Yoke, Quality Circle, Cost of Quality Technique. Quality models such as KANO, Westinghouse Quality measurement systems (QMS) Developing and implementing QMS non-conformance database, inspection, nonconformity reports, QC, QA, quality costs, tools of quality.

### Unit- II

Total Quality Management- Basic Philosophy, Approach, Implementation Requirements & Barriers for TQM. Designing for Quality- Introduction to Concurrent Engineering, Problem solving Methods, problem solving process, Steps in experimental design, Taguchi approach, Achieving robust design, Quality Function Deployment (QFD) Quality function development (QFD).

### Unit- III

Contemporary Trends in Quality Engineering & Management- Just in time (JIT) Concept, Lean Manufacturing, Agile Manufacturing, World Class Manufacturing, Total Productive Maintenance, Bench Marking, Business Process Re-engineering. Quality circles organization, focus team approach, Continuous improvement, 5 S approach, Kaizen, reengineering concepts.

### Unit- IV

Six Sigma Approach- Basic Concept, Principle, Methodology, Implementation, Scope, Advantages and Limitation. Application of six sigma approach to various industrial situations. Quality in Service Sectors- Characteristics of Service Sectors, Value improvement elements, value improvement assault, supplier teaming, vendor appraisal and analysis, Quality Dimensions in Service Sectors, Measuring Quality in different Service Sectors.

### Textbook(s)

1. Dale H. Besterfield, Total Quality Management, Pearson Education, 3rd Revised Edition, 2011.
2. Subbaraj Ramasamy, Total Quality Management, Tata McGraw Hills, New Delhi, 4th Edition, 2012.

### Reference(s)

1. James R. Evans and William M. Lindsay, The Management and Control of Quality, 8<sup>th</sup> Edition, First Indian Edition, Cengage Learning, 2012.
2. K. C. Jain and A. K. Chitale, Quality Assurance and Total Quality Management, Khanna Publication, 3<sup>rd</sup> Edition, 2003.
3. Suganthi, L and Anand Samuel, Total Quality Management, Prentice Hall (India) Pvt. Ltd., 3<sup>rd</sup> Edition, 2006
4. Douglas C. Montgomery, Design and Analysis of Experiments Minitab manual, John Wiley & Sons, 7<sup>th</sup> Edition, 2010.

## 19ME009 Total Quality Management

### Unit- I

Introduction-Definition and principles of quality, Evolution of Quality, Quality Planning, Quality policies and objectives. Dimensions of product and service quality. Contributions of Deming, Juran and Crosby Customer focus. Customer stratification, Customers complaints and Customer retention. Basic concepts of TQM, Barriers to TQM.

### Unit- II

TQM Principles-Employee's- Motivation, Empowerment, Team & Team work, Recognition and Reward, Performance appraisal Benefits of employee's involvement, performance measure, balance score card, Continuous Process Improvement, PDCA cycle, Kaizen 5s, Reengineering Supplier relationship Partnering, Supplier selection, Supplier rating. Customer feedback.

### Unit- III

TQM Techniques- New management tools, New and old 7 QC tools, an affinity diagram, tree diagram, matrix diagram, Six sigma methodology, infrastructure, implementation, Bench marking, process, Taguchi philosophy of quality control. TPM concepts, improvement needs.

### Unit- IV

Quality System- Need for ISO 9000 system, Advantages, Clauses of ISO 9000, Implementation of ISO 9000, Quality costs, Quality auditing, Case studies of TQM implementation in manufacturing and service sectors including IT industry. Need for quality system, Principles, Revision standards.

### Textbook(s)

1. Dale H. Besterfield, Total Quality Management, Pearson Education, 3rd Revised Edition, 2011.
2. Subbaraj Ramasamy, Total Quality Management, Tata McGraw Hills, New Delhi, 4th Edition, 2012.

### Reference(s)

1. James R. Evans and William M. Lindsay, The Management and Control of Quality, 8<sup>th</sup> Edition, First Indian Edition, Cengage Learning, 2012.
2. K. C. Jain and A. K. Chitale, Quality Assurance and Total Quality Management, Khanna Publication, 3<sup>rd</sup> Edition, 2003.
3. Suganthi, L and Anand Samuel, Total Quality Management, Prentice Hall (India) Pvt. Ltd., 3<sup>rd</sup> Edition, 2006
4. Douglas C. Montgomery, Design and Analysis of Experiments Minitab manual, John Wiley & Sons, 7<sup>th</sup> Edition, 2010.

## 20ME004 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 (Karanja 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<sub>2</sub>, CO, NO<sub>x</sub>, SO<sub>2</sub> and O<sub>2</sub>). Bharat Emission norms, Measurement & instrumentation for HC, CO<sub>2</sub>, CO, NO<sub>x</sub> & 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 NO<sub>x</sub> Reduction: Exhaust Gas Recirculation, Lean NO<sub>x</sub> Catalysts NO<sub>x</sub> Absorber Catalysts Selective catalytic reduction.

### Textbook(s)

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

### Reference(s)

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



## **20ME002 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 Directorate 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, 5<sup>th</sup> Edition, 2009.
2. Dollinger, Entrepreneurship, Pearson Education, 4<sup>th</sup> Edition, 2004.
3. Robert J. Calvin, Entrepreneurial Management, Tata McGraw-Hill Education, 2004
4. Vasant Desai, The Dynamics of Entrepreneurial Development and Management Himalaya publishing House, 5<sup>th</sup> Edition, 2017.
5. Kaplan, Patterns of Entrepreneurship, Willey, 4<sup>th</sup> 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.



## 20MEEC33 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, 4<sup>th</sup> 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, 3<sup>rd</sup> 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, 7<sup>th</sup> Edition, Taylor & Francis, 2017.