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## Environmental Studies Components of Engineering Courses in the Universities of Kerala - An Analysis

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**ABSTRACT:** Environmental education is a compulsory subject of study in all levels of education. According to UNESCO and then Supreme court of India in its verdicts at 1991 environmental education will be compulsory in all stages of education including school, college, universities, technical education etc. But there is no observable positive impact on the behavior and attitude of society. To inform or to awake the public or stakeholders and to create eco-friendly products, engineers should have satisfactory knowledge and attitude towards environment, environmental issues, environmental management etc. So the environmental studies in engineering is very important. Here the researcher made an attempt to analyses the environmental studies component of engineering courses in the universities of Kerala.

**Keywords:** Engineering courses, Environmental study components

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### I. INTRODUCTION

Industrialisation and technological developments transformed the way of life. This change finally leads to serious environmental issues. All most all human activities adversely affect the environment, leads to local and global issues. The degradation percentage is growing more and more at the same time the existence of life in the earth is in a big question. At this stage the term environmental protection is significant and the environmental issues become the centre of discussion. Here comes the importance of environmental education. The teaching of environmental education in all levels is to teach students about functions of nature, its components and to live sustainably. It will help to increase people knowledge, awareness and attitude towards environment and associated challenges and to develop necessary skills and expertise to address environmental issues.

According to UNESCO environmental education should be compulsory from primary stage to the post graduate stage. The supreme court of India says in its verdicts at 1991 that all stages of education including school, colleges, universities, technical education etc 'environment' must be a compulsory subject(1). The nodal agency of supreme court for technical education, that is All India Council of Technical Education(AICTE) make necessary action to implement the judgment to follow supreme court order(2). Also the National Policy on Education 1986 (as modified in 1992), which powerfully advocate for the inclusion of environmental education (EE) at all stages of education (3).

The technological advancement of every nation is linked with technical education especially engineering education. For the design and manufacturing of social goods basic knowledge is essential. One of the causes of environmental issues was the unplanned technological development. So the engineers should know about societal needs and how the societal decision affect the environment. Engineers should have the knowledge to inform clients or stakeholders about the long-term consequences of their requirements. To inform or to aware the public or stakeholders and to produce eco-friendly products, engineers should have adequate knowledge about environment, environmental issues, environmental management etc. So the environmental studies in engineering is very important. Here the researcher made an attempt to analyses the environmental education component included in the syllabus and curriculum of B. Tech courses Kerala, Calicut and MG universities of Kerala state.

### II. NEED OF THE STUDY

Though environmental education has made compulsory from primary to higher education, it is reflected that each one of us is not sincerely worried about our environment. Most of us use the term 'environmental protection' in all their endeavors but there is lack in environmental responsible action. Why this happens? Here we have a re-look on our course and curriculum of environmental studies. We should have to know about the contents included in the curriculum, is it have ample scope to develop attitude and motivation responsibly towards environmental issues. Engineering profession has a significant role in protecting our earth from the



serious environmental issues like global warming, ozone depletion, biodiversity loss etc. These global issues may be due to the local small but critical issues like air pollution, drinking water issues, waste management, drainage issues, unsafe recycling units etc. Here the role of engineers come important. They must act locally to protect our earth globally. For that our environmental education must take us from 'knowing' about the environment to the level of 'doing' for the environment (4). For ensuring 'Doing for environment' the engineering course and contents should consider cognitive, affective and psychomotor domains. Here the researcher made an attempt to analyse the contents of environmental study components included in the B.Tech syllabus.

### III. STATEMENT OF THE PROBLEM

The present study entitled as **Environmental Studies Components of Engineering Courses in the Universities of Kerala - An Analysis**

### OBJECTIVES

To analyse and compare the environmental education contents in the B Techsyllabus of different universities of Kerala

### IV. METHODOLOGY

This study follows qualitative approach to accomplish the objective. Document analysis is the method adopted for the study. Current documents and issues serves important sources of data for document analysis. In the present study documents denote the 1st and 11nd semester syllabi of B tech Courses of 3 universities in Kerala. Kerala university 2013 schemes, Calicut University 2014 onwards, MG university 2010 admission onwards.

### V. ANALYSIS

The documents used were the 1st and 2nd semester syllabi of all the 3 universities. These were common to all branches of engineering. The documents were evaluated to know how much weightage were given to the Environmental components with reference to the model Curriculum of the AICTE and compared the three syllabi each other.

**Table 1: Credit and Time allotted for transaction of environmental study components**

SI NO	Name of the university	Paper in which environmental studies included	Credit for the paper	Time allotted for transaction of the content
1	Kerala university	Engineering chemistry	6 credits	Not mentioned in sampled document
2	University of Calicut	Engineering chemistry	3 credits	12 hrs
3	MG university	Engineering Chemistry and Environmental studies	4 Credit	24 Hrs

Analysis of Table 1 revealed that in Kerala and Calicut University the environmental components included in the same paper 'Engineering chemistry'. In MG university area was discussed in a separate paper Engineering chemistry and Environmental Studies. In the case of Credit for the paper which contains environmental studies components of different universities have different credits. There were 6 credit for Kerala university, 4 Credit for MG University and 3 credit for Calicut University. The time allotted for the transaction of the content was also different for MG and Calicut. Only 12 hours was for Calicut University and at the same time MG university curriculum contains 24 Hours. In the case of Kerala university time allocation was not mentioned in the sampled document

**Table 11 : Module and Chapters Discussed Environmental Study components**

University	Module	Chapters		Chapter discussed environmental contents
Kerala university	Module III	2 chapters	1. water technology 2. <u>Environmental science</u>	Environmental science
	Module I	2 chapters	1. Organometalic compounds 2. <u>Green Chemistry</u>	Green Chemistry
University of Calicut	Module IV	2 chapters	1. corrosion and its control 2. water	Water
	Module IV	1 chapter	Environmental pollution	Environmental pollution
MG university	Module V	1 chapter	Environmental issues	Environmental issues



Table.11 shows that Kerala University included the contents in a chapter environmental science in the module III of the paper Engineering Chemistry. University of Calicut discusses the content related with environmental studies in two chapters in two module. The chapters were green chemistry and water. Mg University included the content in two modules and each module contain one chapter related with the area of environment, the chapters were environmental pollution and environmental issues.

**Table III: Environmental content discussed in engineering courses of universities of Kerala**

Name of the university	Calicut university	MG university	Kerala university
Contents discussed under the course	<p><b>Course : Engineering Chemistry</b>                      Module 1                      Chapter 2: Green Chemistry                      Goals of green chemistry – Limitations.                      Twelve principles of green chemistry with their explanations and examples – Designing a green synthesis – Prevention of waste / by products – Atom economy (maximum incorporation of materials used in the process) – Minimization of hazardous / toxic products – prevention of chemical accidents – Green synthesis(9hrs)                      Module IV                      Chapter 2: Water                      Hardness, alkalinity– determination of hardness- EDTA method – Softening – lime soda, Ion exchange methods – purification of water for domestic use.                      Water pollution – BOD, COD, DO (3 Hrs.)</p>	<p><b>Course: Engineering Chemistry &amp; Environmental Studies</b>                      Module 4                      Environmental Pollution (12 hrs)                      Pollution -                      Types of pollution – a brief study of the various types of pollution -                      Air pollution - Sources and effects of major air pollutants – Gases - Oxides of carbon, nitrogen and sulphur – Hydrocarbons – Particulates -Control of air pollution -                      Different methods -                      Water pollution - Sources and effects of major pollutants - Inorganic pollutants- heavy metals cadmium , lead, mercury - Ammonia, Fertilizers and Sediments (silt) - Organic pollutants – Detergents, pesticides, food waste, - Radioactive materials - Thermal pollutants - Control of water pollution - General methods Eutrophication - Definition and harmful effects Desalination of water - Reverse osmosis and Electrodialysis                      Module 5                      Environmental Issues (12 hrs)                      An overview of the major environmental issues -                      Acid rain –                      Smog -                      Photochemical smog - Green house effect -                      Global warming and climate change -                      Ozone layer depletion – Deforestation - Causes and effects -                      Wet land depletion – Consequences,                      Biodiversity – importance and threats,                      Soil erosion - Causes and effects,                      Solid waste disposal -Methods of disposal -                      Composting,                      Landfill, and Incineration,                      E-Waste disposal - Methods of disposal – recycle( recovery) and reuse                      Renewable energy sources - Solar cells –                      Importance - Photo voltaic cell -                      a brief introduction Bio fuels -                      Bio diesel and Power alcohol</p>	<p><b>Course : Engineering Chemistry</b>                      Module 111                      Chapter 2: Environmental Science:                      Air pollution – Sources, effects and control methods,                      Water pollution – Sewage, aerobic and anaerobic decomposition – BOD and COD,                      Sewage treatment – Tickling filter method and UASB process.                      Environmental Issues – Photo chemical smog – CFCs and ozone depletion – Alternative refrigerants – Green house effect.                      Solid waste disposal – Methods of disposal – Composting, Landfill and Incineration.                      E– Waste,                      Methods of disposal – recycle, recovery and reuse.</p>

Data from table 3 revealed that MG University syllabus contains much better environmental studies content than Kerala and Calicut. The contents related with environmental education was few in University of Calicut when comparing the two.

**5.2.Environmental studies component in relation with AICTE model curriculum**

AICTE model curriculum discusses the contents in 8 well flourished units and the 8th unit is a field work. The area discussed under environmental studies curriculum mandatory for all discipline ate listed here

**Unit 1: The Multidisciplinary nature of environmental studies**

Definition, scope and importance, Need for public awareness.

**Unit2: Natural Resources Renewable and nonrenewable resources**

Renewable and nonrenewable resources, Natural resources and associated problems,  
 Role of individual in conservation of natural resources, equitable use of resources for sustainable life -styles.

**Unit 3: Eco Systems**

Concept of an eco system, Structure and function of an eco system. Producers, consumers, decomposers.  
 Energy flow in the eco systems. Ecological succession. Food chains, food webs and ecological pyramids.  
 Introduction, types, characteristic features, structure and function of the following eco systems: Forest



ecosystem, Grass land ecosystem, Desert ecosystem. Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries)

#### **UNIT 4: Biodiversity and its Conservation**

Introduction-Definition: genetics, species and ecosystem diversity. Biogeographically classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, Aesthetic and option values Biodiversity at global, national and local level. India as a mega diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitats loss, poaching of wild life, man wildlife conflicts. Endangered and endemic spaces of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

#### **UNIT 5: Environmental Pollution**

Definition Causes, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards  
Solid waste Management: Causes, effects and control measures of urban and industrial wastes Role of an individual in prevention of pollution Pollution case studies Disaster management: Floods, earth quake, cyclone and land slides

#### **Unit 6: Social issues and the Environment**

Form unsustainable to sustainable development, urban problems related to energy. Water conservation, rain water harvesting, water shed management .Resettlement and rehabilitation of people; its problems and concerns, case studies .Environmental ethics: issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. Wasteland reclamation .Consumerism and waste products .Environment protection Act .Air (prevention and control of pollution) Act. Water (prevention and control of pollution) Act .Wildlife protection act .Forest conservationact. Issues involved in enforcement of environmental legislations. Public awareness

#### **Unit 7: Human population and the environment**

Population growth and variation among nations. Population explosion- family welfare program. Environment and human health .Human rights. Value education .HIV / AIDS.Women and child welfare. Role of information technology in environment and human health .Case studies

#### **Unit 8: Field work**

Visit to a local area to document environment Assets River / forest / grassland / hill / mountain. Visit to a local polluted site-urban/rural/industrial/agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hills lopes, etc (field work equal to 5 lecture works)

#### **5.3. Analysis of environmental contents in B Tech syllabus of Kerala University**

Kerala university curriculum is not par with the model curriculum given by the AICTE. It only discusses the air pollution, water pollution and its management and some environmental issues like smog, ozone depletion, and greenhouse effects etc. Following contents are **not included** in the syllabus

The Multidisciplinary nature of environmental studies

Natural Resources Renewable and nonrenewable resources

Eco Systems

Biodiversity and its Conservation

Human population and the environment

#### **5.4. Analysis of the syllabus of B tech courses of University of Calicut**

B tech courses of university of Calicut lack the content emphasised by the AICTE. It lack almost all the content of model curriculum by AICTE and discusses Green chemistry and water related contents, its purification etc

The following contents are not included

The Multidisciplinary nature of environmental studies

Natural Resources - Renewable and nonrenewable resources

Eco Systems

Biodiversity and its Conservation

Human population and the environment

Environmental Pollution

Social issues and the Environment.



### 5.5 Analysis of the environmental education contents in B tech syllabus of MG University

The contents of MG universities are different types of pollution and environmental issues like acid rain. Ozone depletion, e wasteetc.  
It also lack most of the contents emphasised by AICTE. The following contents are not includein Mg university B tech syllabus.

The Multidisciplinary nature of environmental studies  
Natural Resources Renewable and nonrenewable resources  
Eco Systems  
Biodiversity and its Conservation  
Human population and the environment

## VI. DISCUSSION

The three universities included environmental components in their syllabus. Environmental studies put forth by the AICTE is completely lack in the syllabi of Calicut university and the Kerala and MG university included little bit content same as that of the model put forth by AICTE. The three universities Kerala Calicut and MG universities lack the field work in the syllabi. Field work is an important part to have first hand experiences to the students. Inclusion of environmental issues are lack in the syllabus of Calicut university syllabus.

## VII. CONCLUSION

Environmental studies is a compulsory subject in all the stages of education according to UNICEF and the Indian supreme court made it compulsory to al stage by its verdict in 1991. But the curriculum developers of higher education especially technical education not given due importance to the contents. When analysing with the model curriculum by the AICTE three universities of Kerala lack most of the contents included in the model curriculum. There is an urgent need to revamp the curriculum with more emphasis to environmental education components to materialize the vision of Education for Sustainable Development.

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