

# GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. (Energy Engineering)

## PROPOSED TEACHING SCHEME

(W.E.F. July 2012)

### Semester III

SR. No.	SUBJECT	TEACHING SCHEME(HOURS)			CREDITS
		THEORY	TUTORIAL	PRACTICAL	
	Major Elective IV	4	2	0	5
733901	Green Energy Engineering	2	0	0	2
730001	Seminar	0	0	4	2
730002	Presentation of Literature Review	0	0	0	2
730003	Dissertation Phase-I	0	0	18	9
	<b>TOTAL</b>	<b>6</b>	<b>2</b>	<b>22</b>	<b>20</b>

Sr. No.	Major Elective - IV
733902	Bio Energy Engineering
733903	Cryogenics Engineering
733904	Energy Efficient Devices

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## Master of Engineering (Energy Engineering)

### Semester: III

Subject Code :733901  
Subject Name : Green Energy Engineering

Sr. No.	Course Content
1	<b>Basic concepts and Fundamentals of Green Energy</b>  Introduction, Energy Systems: Their Composition, Energy Systems: Their Adverse Impacts, Energy Systems: The Dilemma, Green Energy and Sustainability: The Target and Solution, Diversification and Localization of Energy Systems: A Means to Sustainability and Energy Security.
2	<b>Energy Analysis of Green Energy Systems</b>  Introduction, Green Energy and Sustainable Development, Importance of Energy Analysis, Energy and Energy Analyses, Case Study 1: Energy Analysis of Solar Ponds, Case Study 2: Energy Analysis of Wind Energy Systems
3	<b>Energy Economics and Taxonomy</b>  <b>Principles of Economics:</b> Scarcity, opportunity cost, Efficiency - Resource allocation through market mechanism - Market failure and role of state <b>Energy Taxonomy:</b> Types of energy: oil (including the implications of OPEC), natural gas, coal, solar, wind), their merits and demerits, economic issues (effect of price controls, costbenefit) and environmental perspectives - Renewable and non-renewable energy – Commercial and non-commercial energy - The McCKelvey classification of energy resources.
4	<b>Energy Policies &amp; Issues</b>  Energy Demand, Global and Indian trends ,Determinants of energy demand, energy productivity and management of energy demand ,Policy toward Electricity in India: pricing, implications of state subsidies, case for and against privatization in electricity generation and distribution, relevance to India of California experience in privatization of electricity distribution - Potential for renewable energy use in India (solar and wind energy).

## **Reference Books**

1. Kanchan Chopra and VikramDayal (2009), “High Economic Growth, Equity and Sustainable Energy Development”, In (ed) Oxford Handbook of Environmental Economics, Oxford University Press, New Delhi.
2. Parry C Field (2001), “Natural Resource Economics”, Mcraw Hill.
3. Nick Hanely, Jason F Shogren and Ben White (2001), “Introduction to Environmental Economics”, Oxford University Press.
4. Green Energy Basic concepts and Fundamentals by Xianguo Li
5. Energy Audi and Energy Management(Vol-1),CRC Press

# GUJARAT TECHNOLOGICAL UNIVERSITY

## Master of Engineering (Energy Engineering)

### Semester: III

Subject Code:733902

Subject Name: Bio Energy Engineering  
(Major Elective-IV Chemical Group)

Sr. No.	Course Content
1.	<b>Biomass</b>  Biomass resources and biomass properties, classification, availability, consumption and surplus biomass, energy plantation, Agriculture Crop & Forestry residues used as fuels. Proximate analysis, Ultimate analysis, thermo gravimetric analysis and summative analysis of biomass – briquetting.
2.	<b>Biochemical</b>  Combustion, Gasification, Biomass gasifiers and types etc. Applications of Gasifiers to thermal power and Engines, Biomass as a decentralized power generation source for villages Concept of Bio-energy: Photosynthesis process, Bio-fuels, Biomass resources Bio based chemicals and materials
3	<b>Thermo-chemical Conversion</b> Pyrolysis, Combustion, Gasification, Liquefaction. Bio-Chemical Conversion: Aerobic and Anaerobic conversion, Fermentation etc.
4.	<b>Bio-fuels</b> Importance, Production and applications. Types of Bio-fuels, Production processes and technologies, Bio fuel applications, Ethanol as a fuel for I.C. engines, Relevance with Indian Economy. Bio-based Chemicals and Materials: Commercial and Industrial Products, Biomass, Feed stocks, Chemicals, Plastics, Fibres etc. Government Policy and Status of Bio fuel technologies.
5.	<b>Biomethanation</b> Importance of biogas technology, Different Types of Biogas Plants. Aerobic and anaerobic bioconversion processes, various substrates used to produce Biogas (cow dung, human and other agricultural waste, municipal waste etc.) Individual and community biogas operated engines and their use. Removal of CO <sub>2</sub> and H <sub>2</sub> O, Application of Biogas in domestic, industry and vehicles. Bio-hydrogen production. Isolation of methane from Biogas and packing and its utilization.

## Reference Books

1. Biomass for energy in the developing countries – D.O.Hall, G.W.barnard andP.A.Moss (Pergamon Press Ltd. 1982)
2. Thermo chemical processing of Biomass, Bridgurater A V.
3. Khandelwal, K. C. and Mahdi, S. S., Biogas Technology - A Practical Hand Book - Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
4. Biomass as Fuel – L.P.White (Academic press1981)
5. Biomass Gasification Principles and Technology, Energy technology review No. 67, - T.B. Read (Noyes Data Corp. , 1981)

# GUJARAT TECHNOLOGICAL UNIVERSITY

## Master of Engineering (Energy Engineering)

### Semester: III

Subject Code :733903  
Subject Name : Cryogenics Engineering  
(Major Elective-IV Mechanical Group)

Sr. No.	Course Content
1	Introduction to low temperature engineering – cryogenics – principle of cryogenics – methods of production of low temperature.
2	Cryogenic fluids – superconductivity and its applications – properties of cryogenic fluids – super fluidity– selection of cryogenic fluids
3	Cryogenic systems – Claude system – LindeHampson system – Heylandt system – Stirlingcryocooler – Gifford McMahon cryocooler – thermodynamic analysis of above systems.
4	Instrumentation in cryogenics – temperature, pressure, flow, level measurements – cryo probes – cryostats– medical instrumentation.
5	Application of cryogenics – thermal, electrical and magnetic properties of metals, alloys and non-metals at cryogenic temperature – cryogenics for industry – food preservation – medicine – space.

#### ReferenceBooks

1. Barron,Randelf.,CryogenicSystems,OxfordUniversityPress,1985.
2. Dinnerhaos,Q.D.,CryogenicEngineering,McGrawHill BookCo.,1987.
3. KlausD.TimmerhausandThomasM.Flynn,CryogenicProcessEngineering,Plenum Press, 1989.
4. Hasdden,G.G.,CryogenicFundamental,AcademicPress,1971.
5. MartiaDonabedian,SurveyofCryogenicCoolingTechniques.

# GUJARAT TECHNOLOGICAL UNIVERSITY

## Master of Engineering (Energy Engineering)

### Semester: III

Subject Code :733904

Subject Name : Energy Efficient Devices (Major Elective-IV Electrical)

Sr. No.	Course Content
1	<b>Variable Speed Drive</b> Introduction, Concept of variable frequency Drive, VFD system, Selection of variable speed drives, Information needed to evaluate Savings for variable speed application, Barriers in Application of VSD, speed control methods of Electrical/Mechanical Drives, Analysis of VFD Benefits, Performance Assessment of VFD.
2	<b>Lighting system</b> Introduction, Basic Terms in Lighting system, Types of Lightning system, Luminaire, Lamp Types and their features, Recommended I luminance Levels, Lightning survey(Performance Assessment of Lighting System),Energy Conservation in Lightning Survey, Case study and case Examples.
3	<b>Industrial Heating and welding</b> Introduction, Direct and Indirect Resistance heating, Induction Heating, Induction Furnace, Dielectric heating, Arc Furnace, Energy Losses of Electric Furnace/ovens, Furnace Efficiency, Energy Saving Measures in Electrical Furnace, Electro chemical process, Energy Conservation in welding process.
4	<b>Energy Efficient Technologies</b> Maximum Demand Controller, Automatic Power Factor Controller, Energy Efficient Transformer, Electronic Ballast, Energy Efficient motor, soft starter.
5	<b>Energy Saving in Various Sectors</b> Domestic Sector, Agriculture Sector, Transport Sector, Industrial sector, Energy conservation by reducing T&D Losses ,Demand side management, Case study and Examples

### Reference Books

1. Energy Efficiency in Electrical Systems by V.K Gaudani (Vol-II) IECC Press.
2. Hand book of Energy Efficiency by CRC Press.
3. BEE reference book no1/2/3/4.